

Technology Review

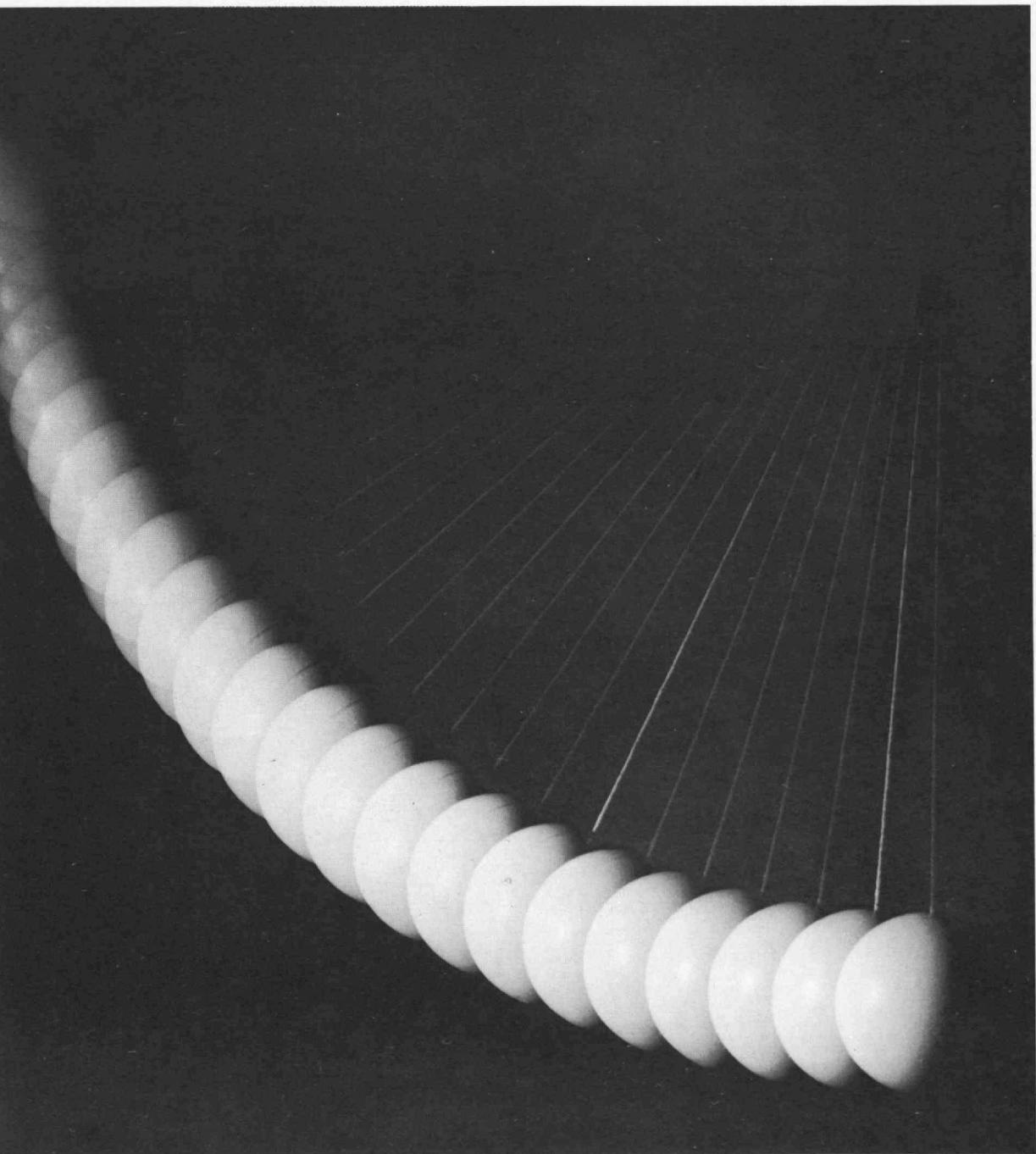
Edited at the Massachusetts Institute of Technology

January, 1967

R&D After Apollo,
page 13

How To Make Science
a Plain Delight

*(Use the optical instrument
bound into this magazine,
make your own pendulum, and
read how a "black box"
can make a good teacher)*



technology review

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A science-fiction buff with straight "A" in math... now Blair Tyson plots a course to the moon.



From simple addition to analytical geometry, math was a snap for Blair Tyson. He was not only a whiz kid at mathematics, but he had an absorbing interest in any and all types of science fiction.

Graduating from the Milwaukee School of Engineering in 1958,

Blair began working with computers for an electronics company. Here is where his background in science fiction and his aptitude for mathematics merged and were given direction. This combination of interests led him one way . . . to the AC Electronics Division of

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Now he works on airborne digital computers. It is AC's job to integrate these computers into the guidance systems for space project, Apollo.

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Effective in January, 1967, Technology Review is being mailed in a sequence based upon U.S. Post Office zip code numbers. Readers may wish to verify their zip numbers as shown on the mailing labels for this issue, notifying the Business Manager, Room E19-438, M.I.T., Cambridge, Mass., 02139, of any error.



Next month: Edwin E. (“Buzz”) Aldrin, '63 (left), tells the story of Gemini 12 and his record-breaking EVA (extra-vehicular activity). Also articles on man's search for new materials that do not exist (by George A. W. Boehm) and the future of the railroads in intercity passenger service (by William H. Tucker and Robert M. Glennon).



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Engineers as Big Brothers?

By Robert C. Cowen, '49

Systems engineers in the big aerospace companies have mastered the complexities of space flight. Now they want to go to work on you and me.

They want to focus their skills on some of the demanding social problems of our time—problems of pollution, urban renewal, mass transport, and mounting crime. They feel they have something special to offer toward solving such problems. They are probably right. But they have yet to learn their limitations. They have yet to show clearly how the freedom, dignity, and distinctiveness of the individual would be preserved in their massive planning for a better world.

Elroy (Crazy Legs) Hirsch, Vice-president of the Los Angeles Rams, has put the matter succinctly. He was commenting on a scheme to replace football coaches with computers programmed to take account of the strengths and weaknesses of opposing teams. "This," he said, "could lead to the systems engineers playing through machines against each other while the players act like puppets on a stage."

Systems and Social Problems

Would the people be mere puppets in the engineered cities of the future?

John H. Kuhn of the Space-General Corporation puts it a little differently. "If you can envision engineers working with people, you can imagine the problems we have," he says. He speaks as a battle-scarred participant in that process.

Mr. Kuhn's company shared in the "California experiment." In this, former Governor Edmund G. Brown let \$100,000-contracts to each of four aerospace companies for systems studies. They included such topics as waste management and a statewide information system. While nothing dramatic came out of the studies, Governor Brown was pleased enough to order more. Space-General, for example, is working on a \$200,000 study of the social welfare system.

Meanwhile, Senator Gaylord Nelson (D) of Wisconsin introduced a bill in the last Congress to authorize the Secretary of Labor to spend \$125 million for systems work on social problems at state and local levels. Not to be outdone, 44 Republican congressmen and 10 senators sponsored bills to give systems engineers a go at water pollution and urban renewal.

These bills came to naught. But they

will likely be reintroduced in the new Congress. They probably will be accompanied by a bill from Representative Emilio Q. Daddario (D) of Connecticut. This would implement a recommendation of the House Science and Astronautics Committee that the aerospace firms be put to work on problems of waste disposal.

Thus the social role of the systems engineer seems assured. If that role is to be a happy one, both the engineers and the rest of society need to learn new graces. According to Mr. Kuhn, the big question is "how to apply systems management and systems analysis to people." There also is much to be learned in getting people, both as individuals and as political units, to help the engineers do this.

After letting the four initial contracts, Governor Brown found no one within his administration who could monitor them. He hired the Systems Development Corporation to do the job. Frank B. Coker of that company says this lack of technical competence in local government is one of several deficiencies that must be corrected if engineers are to attack social problems fruitfully.

More states and local governments, he says, must follow California's example in paying their share of the costs of adapting modern problem-solving techniques to their needs. If they rely on the federal government, they won't develop the local competence and organization to apply these techniques over the long run. Also, he says, community leaders must educate themselves to understand what the engineers can and cannot do.

At the same time, the engineers have to learn to deal with the political world. Working out a new waste-disposal system or criminal-control methods may cut across long-established political units and local traditions. Such political problems, Mr. Coker says, "are often side-stepped by the scientific and engineering mind which wants only to produce a clean technical solution to a carefully circumscribed problem . . ." The real problem contains the political variables, so the real solution must also.

Safeguarding Individual Freedom

Then there is the question of how to take account of the rights and aspirations of the individual. It is an emotion-charged issue.

This was exemplified in a technical meeting when Kenneth T. Larkin, '62, of Lockheed Missiles and Space Company discussed the merits of putting all government files on individuals in a central computerized store. This is being done in Santa Clara County, Calif. Several states, as well as the federal government, are considering it. Congress has held up the federal plan be-

cause of possible invasions of privacy.

Mr. Larkin drew a sharp response. A questioner pointed out that, increasingly, one's individual business is done with government so the file would grow in many directions. "You could sum these things up and find out more about me than I want you to know," he said. Mr. Larkin admitted that he, too, is worried over the "big brother" aspect of this. "I certainly accept the point . . . the right of privacy of the individual has to be respected . . ." he said. But, he added, "it is a tough political problem to decide who has access to the records." He had no solution.

Professor John McCarthy of Stanford University has pointed out that, legally, there is no right to privacy in such cases. He explained in the September, 1966, *Scientific American*: "Most individual rights now recognized are based on the claim that the individual always had them . . . Technology is advancing too fast, however, to allow such benevolent frauds to work in the future. The right to keep people from keeping files on us must first be invented, then legislated and actively enforced."

Following the Larkin discussion, a paper on city planning also drew heated comment. In it, Vernal M. Tyler and Carl F. Asiala, Jr., of the McDonnell Aircraft Corporation, described the challenge to aerospace skills in urban planning. A city needs to be designed as a total system, they said, to meet modern needs.

They proposed a city built of 100-story buildings. These would encase factories, offices, and people in a controlled environment. You would never have to leave it, except for country recreation. Transport between buildings would be by enclosed conveyor belts. Between cities, it would be by monorail or subway.

One man could scarcely wait for the presentation to finish to declare, "My blood is hot and boiling. Why do we want this conformity? Some people would never see the sun!" Another man rose to proclaim, "I don't want to live in that Orwellian fantasy. What about me? I want my own home!"

Tyler and Asiala did point out the need to take individual values into account. But they didn't satisfy their audience that their schemes for individualized apartments would do this.

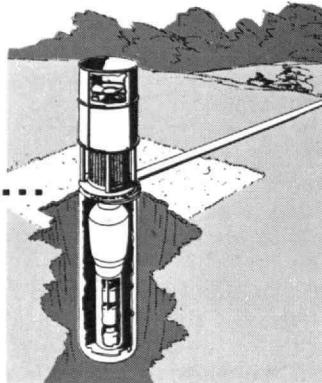
The aerospace industry has distinguished itself in tackling complex technical problems. It should be uniquely equipped to tackle massive social problems too. But the biggest challenge is to marry the engineer's techniques to the realities of society. Even the engineers are deeply disturbed over the lack of clear thinking on how to deal with people.

ENGINEERS & SCIENTISTS

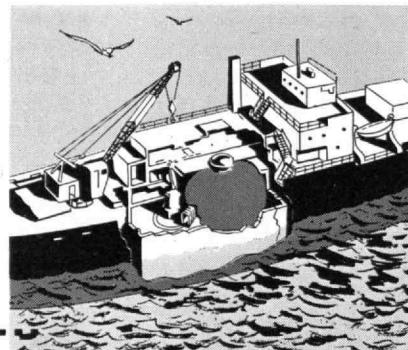
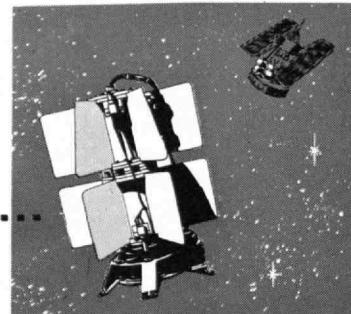
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The Natural History Of Human Behavior

By Joseph Mindel

Konrad Lorenz, Austrian naturalist and biologist, is a pioneer of the relatively new science of ethology, the biological study of animal behavior. In his book, *On Aggression* (Harcourt, Brace and World, New York, 1966, 306 pp., \$5.75), Dr. Lorenz, now director of the Max Planck Institute for Behavioral Physiology in Bavaria, brings together the conclusions of 35 years' study and extends them to the behavior of human beings. His subject matter is intrinsically interesting, his examples are numerous and pertinent, and his reasoning is persuasive. Therefore it behoves the reader to be wary.

Dr. Lorenz is well aware of the special hazards that beset an ethologist—the dragon of teleology and the morass of anthropomorphism. He avoids them decisively and with style. He sees living things as the present state in an evolutionary process, determined by the operation of two mechanisms, mutation and natural selection, which he calls the great constructors of evolution. In this context, "What for?" is a proper question. "If we ask, 'What does a cat have sharp, curved claws for?' and answer simply by saying, 'To catch mice with,' this does not imply a profession of any mythical teleology, but the plain statement that catching mice is the function whose survival value, by the process of natural selection, has bred cats with this particular form of claw."

As for anthropomorphism, his attitude is perhaps best described in his earlier book, *King Solomon's Ring*. "Believe me, I am not mistakenly assigning human properties to animals: on the contrary, I am showing you what an enormous animal inheritance remains in man, to this day."

Blue angelfish, graylag geese, ravens, deer, wolves, lemurs, monkeys, baboons, and animals of many other species exhibit a type of behavior that Lorenz calls aggressive. If an inch-long, brightly colored coral fish approaches another, the second attacks immediately, and unless the intruder flees one of them will die in the ensuing battle. Similarly a stag locks antlers with another, while overhead robin fights with robin. This behavior, which is not the same as that of a predator attacking its prey, has two distinguishing features: it is directed against the same species, and it originates in the

defense of a territory against deliberate or unwitting invasion. The territory may be a square foot of ocean bottom or a square mile of forest, it may be traversed by thousands of fish, birds, or animals, but only an organism of the same species as the territorial defender evokes patterns of aggression.

Aggression is not all bad. The title of the book (originally published in 1963) from which this translation was made is *So-called Evil: On the Natural History of Aggression*. Territorial behavior and the aggression based on it have important survival values. The population of a species is spread evenly over the available habitat. The selection of the best and strongest animals for reproduction is favored. And in conjunction with another mechanism, the survival of the weaker members of a group is ensured.

Lorenz calls this mechanism ritualization. Many types arise in the evolution of a species, each ritualized pattern having the same force, but a different result, as the original drive that it replaced. Thus, a fight between two wolves would invariably end in the death of one. In a wolf pack, however, the weaker in such a fight suddenly ends his resistance, his unprotected jugular vein an inch from the other's muzzle. The winner growls, snaps his teeth in the empty air, and withdraws, inhibited by a ritualized behavior pattern from carrying out the final act of aggression.

When we come to man, a territorial animal like angelfish, lemurs, and geese, engaged in fearsome aggression against others of his species, it is time to be wary, for assumptions and metaphors, stated and implicit, lie beneath the explanations of human behavior.

What elegant explanations they are!

Wolves, lions, and other large carnivores with powerful weapons have evolved inhibitory mechanisms against aggression. The dove, lacking weapons and inhibitions, will peck a cage mate to death. Man is like the dove, weak and uninhibited. . . . In man, ritualized drives are not hereditary as in animals, but must be transmitted by tradition. Smoking the peace pipe, shaking hands, and manners, in general, are examples of cultural ritualizations. . . . The cultural evolution of man proceeds like the biological evolution of species, preserving useful drives but providing inhibiting mechanisms. That is why "the most important imperatives of the Mosaic, as of all other laws, are not commandments but prohibitions."

Whether one accepts the assumptions that Dr. Lorenz makes probably depends less on biology than on metaphysics and one's image of man. The existence of human instincts, even if

they are called innate behavioral patterns, is not granted by everyone. Nor, I think, would all anthropologists agree that cultural and biological evolution are analogous in the sense that Dr. Lorenz conceives them to be.

Even if the assumptions are accepted, however, there is still the question of metaphor. Analogical reasoning is a powerful tool, risky in proportion to its worth. The fact that certain ant species obtain a sweet exudate from aphids they keep in their nests throws no light on the domestication of animals by man. The defense of their "turf" by street gangs may or may not be a case of territorial behavior, depending on facts that are not evident from metaphor alone. Example, as the saying goes, does not prove anything. But metaphor can illuminate and suggest, thus leading to new approaches, new facts, new concepts.

On Aggression is illuminating and suggestive. It contains insights into the natural causes of aggression which, Dr. Lorenz believes, may endow us with the power to control its effects.

Man and His Territory

The same subject is treated in *The Territorial Imperative* (Atheneum, New York, 1966, 390 pp., \$6.95) by Robert Ardrey, although with somewhat different emphasis, as indicated by the subtitle, "A Personal Inquiry into the Animal Origins of Property and Nations." The book moves quickly from aggressive behavior of individual territorial animals to the formation of societies and nations, in which property is seen as the equivalent of territory.

Mr. Ardrey is not a scientist, but a playwright who became interested in anthropology. He has collected much interesting material and organized it well. He is not inhibited, as a scientist might be, by colleagues breathing over his shoulder, so that his imagination has freer rein. Thus, for example, Russian collective farms have failed, he believes, because they run counter to the human territorial instinct. Observing that among animals the proprietor of a territory almost always wins against the intruder, he explains why the Japanese lost the war despite, or rather because of, Pearl Harbor. He also tackles the League of Nations, the new African states, and Vietnam, in addition to venturing a mathematical equation for "the amity-enmity complex."

There is little point in comparing the two books in detail; both should find appropriate audiences. It should be said, however, that while *On Aggression* is suggestive, thereby stimulating and engaging the reader, *The Territorial Imperative* is explicit and literal, negating its underlying metaphor.



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Universities and Cities

By Corbin Gwaltney

America's colleges and universities today are hearing a call to service similar to one issued by the Congress of the United States in the days of Abraham Lincoln's presidency.

Colleges and universities theretofore had been concerned mainly with liberal arts and with the classical, European style of education. Then, in the dark days of the Civil War, Congress enacted legislation that led to the land-grant college system. In doing so, Congress put U.S. higher education in the service of the nation's agricultural and industrial progress—and thus did much to give our brand of higher education its distinctive, serve-the-people character.

The crisis that moved Congress in the Nineteenth Century was a need for revolutionary developments in our farms and factories. Today, the crisis is a need for revolutionary developments in our cities.

A Central Force on Major Issues

Not long ago, a reporter asked M.I.T.'s new president, Howard W. Johnson:

"What is your major priority for M.I.T.?"

Mr. Johnson replied:

"I would say the urban setting . . . I mean the city—the whole system of problems related to city planning, regional economic development, education development, and transportation development."

"I see a growing concern for the application of science to human problems, the systems-type problems, whether they relate to industry, the urban setting, medicine, or transportation."

More and more persons, nowadays, are thinking the same way about the same kinds of problems.

Last month the topic occupied the attention of the Subcommittee on Executive Reorganization of the U.S. Senate Committee on Government Operations. James M. Hester, the President of New York University, was among those who testified. Among his remarks before the Subcommittee:

"Today the nation's most pressing need . . . is an urban revolution. I believe such a dramatic development can be based on effective use of our educational resources."

"As the Congress of 1862 made an historic move to examine our agricultural and engineering productivity, so similar legislation for our time could

assist a renaissance in urban life."

To Mr. Hester, education holds the key: "I believe a new approach to education in the city is essential if we are to have a true renaissance of urban life," he said.

A few days later, the Secretary of Housing and Urban Development spoke toward the same topic and developed the same theme at a Washington conference on urban affairs:

"The university," he said, "must become more and more the crucible for new ideas in meeting the urban challenge. This implies a new order of research activity which must encompass many disciplines . . .

"The next order of business for the universities is to train a whole new order of urban expert. This country is starving for good planners and good public administrators and good social psychologists . . .

"[And] we need to train a new kind of urban generalist, the man who can administer the kinds of new programs—such as Model Cities—which are going to make their appearance in the next few years. *And it is the universities which must bear most of the burden in producing this new kind of Renaissance man. . . .*"

My italics.

By mid-December, the voices calling for university action on the problems of American cities had the sound of a large chorus. Senator Abraham Ribicoff, the Connecticut Democrat who formerly was Secretary of Health, Education, and Welfare and who now chairs the Senate subcommittee that had been conducting hearings on the cities' plight, spoke on the subject at a dinner at Yeshiva University, New York:

"For many years, Einstein . . . has been our academic model. We still need our Einsteins. But we also need our Edisons—the *men of action* who can apply their knowledge to the immediate task at hand. . . .

"Second, *our universities should offer* degree programs in urban studies. . . .

"Third, *the university should develop* urban extension programs to meet the immediate and pressing needs in a community or a neighborhood . . . A university extension service would be invaluable in helping our migrants from rural America learn how to live in urban America.

"Fourth, *the university should offer* refresher, in-service training programs to public officials who want to improve their skills and learn new techniques of administration as well as new theories and discoveries about human behavior.

"Fifth, *the university should conduct* research into the major issues of the

day—issues such as crime and violence, pollution, and transportation . . .

"Sixth, *our urban universities should pool* their research efforts and establish urban action centers in all our major metropolitan areas. . . ."

The italics (mine, again) give proof, if any be needed, how naturally, even instinctively, we regard the university today as the central force in coming to grips with the important problems of our society.

Toward Urban Grant Universities

John W. Ryan, Chancellor of the University of Massachusetts' branch in Boston, last month put the demands for action in these particularly plain terms:

"Today we have the opportunity and responsibility . . . to bring the land-grant act up to date, to give the Twentieth Century its intellectual and educational helpmeet, just as the Nineteenth Century had its own . . .

"I call for an Urban Grant University Act which would make possible a creative partnership in the major programs developed to improve our urban society:

"A creative partnership between federal, state, and local jurisdictions to obviate inequities of service burdens and costs, and to gain a multiplier effect in benefits received from university participation in program planning, operation, and evaluation.

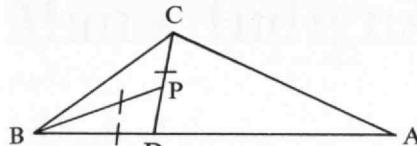
"A creative partnership between the academic institutions, public and private, which now exists at a few urban universities, which already have plunged into the effort to deal with urban problems.

"A creative partnership between the intellectual community of all urban institutions and the professional community of administrators, officials, and public servants charged with activist responsibility in the campaign for improved urban conditions of life and work.

"I call for an Urban Grant University Act which would set up the urban university as a new vista in the several programs having specific goals and responsibilities in such areas as housing, health, recreation, economic opportunity, educational opportunity, and others."

The crisis of American cities is real. It is complex. It can be met only with advanced knowledge, advanced philosophies, advanced techniques. It is the sort of crisis in which universities, in the American concept, are uniquely, indispensably equipped to play the part of problem-solver. That we are now about to see them assume that role—or to have it thrust upon them—is evident.

20—Prove that it is impossible to construct a point P in the general triangle ABC such that $CP = BP = BD$.



Submitted by Mark Yu, '70.

Solutions

1—The problem:

W A S M A R C H
+ T H E B E S T
C A N D I D A T E

The product $H \cdot E \cdot R \cdot B \cdot I \cdot D$ equals 0. And M, which does not equal zero, equals C \cdot W.

The following was contributed by Don B. Zagier, '70:

We consider only the case where W, T, and C are nonzero (i.e., the numbers are real 8-, 7-, and 9-digit numbers). This is not a partial solution: since I produce 2 solutions, though the problem was supposed to have a unique solution, it is the problem rather than the solution that fails to be exhaustive. The solutions are

$$\begin{array}{r} 90790912 \\ + 9219179 \\ \hline 100010091 \end{array} \quad \begin{array}{r} 90790813 \\ + 9320279 \\ \hline 100111092 \end{array}$$

Method: Plainly, W is 9, C is 1, A is 0. Hence $M = CW = 9$. The third column then gives T is 9, N is 0. E = 0 leads to a contradiction, so the seventh column gives $R + E = 10$, $D = B + 1 \pmod{10}$. $H = 0$ gives a contradiction, so from the last column $H = E + 1$, so S is 7 from the 8th column. From $H \cdot E \cdot R \cdot B \cdot I \cdot D = 0$ we get $H = E + 1 = D + 2$. There are now two possibilities from the 6th column: $D = 0$, $B = 9$ (which gives first solution) or $B \neq 9$, $D = B + 1$, $D = I$, $R + D = 9$, and R or $B = 0$ (from $H \cdot E \cdot R \cdot B \cdot I \cdot D = 0$) so (since the 4th column gives $D \leq 7$) $D \neq 9$, $R \neq 0$, so $B = 0$, $D = I = 1$, $R = 8$, and we have the second solution.

David R. Spencer, '63, also submitted both solutions. The latter was also provided by Robert H. Parker, '70, Richard Bator, '65, and William W. Upham, '23; and the former by Kalman Shure, '51, John L. Joseph, '40, and Mark H. Yu, '70, who also found a completely different solution, "No."

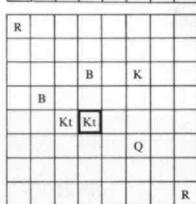
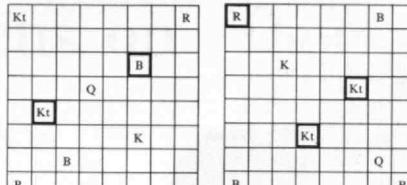
2—The problem:

Given the eight rear-rank pieces, place them on a board in such a way that they cover every square (i.e., any piece of the opposing color placed anywhere on the board may be taken in one move). The two bishops may not be of the same color.

Zagier again:

I have found several solutions. The problem as stated does not require one to cover one's own pieces (since they are not enemy pieces). Three solutions are shown at the top of the next column.

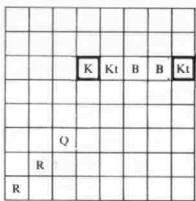
Darkened squares represent unprotected pieces; the third is the "best" in that all your own pieces but one are covered.



Kalman Shure, '51, writes:

The introduction of Puzzle Corner as a regular feature in Technology Review arouses mixed emotions within me. Puzzles tend to become like peanuts or pretzels with me—that is, I can't leave them alone; and although enjoying both, I can certainly do without them.

His solution to problem 2 is unique in that one of the bishops is superfluous.



He adds, "It should be evident that many other arrangements using the three ell-shaped and one square-shaped blocks can be made."

The problem was also solved by Toby Eisenstein, wife of Bruce A. Eisenstein, '63, Stephen A. Kliment, '53, Thomas L. De Fazio, '61, and George N. Krebs, Jr., '62.

If anyone can find a solution in which all the pieces are covered, I will welcome it.

3—Simplify the following:

$$\begin{aligned} & \lim_{z \rightarrow \infty} \left(1 + \frac{1}{z} \right)^z \\ & \int_1^{\infty} \left(\frac{\pi}{2} - \tan^{-1} x + \frac{\sum_{k=1}^{\infty} (-1)^{k+1}}{(2k+1)x^{2k+1}} \right) dx \\ & - \frac{1}{2} (e^{ia} - e^{-ia})^2 + \cos 2\alpha \\ & - \sum_{n=0}^{\infty} \frac{\cosh y \sqrt{1 - \tanh^2 y}}{\left(\sum_{j=0}^{\infty} \frac{\cosh \gamma \sqrt{1 - \tanh^2 \gamma}}{2^j} \right)^n} \end{aligned}$$

The following solution was contributed by Mark B. Pelcovits, '70:

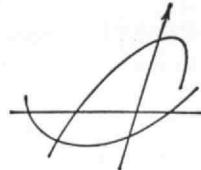
The upper limit of the integral is

$$r = \lim_{z \rightarrow \infty} \left(1 + \frac{1}{z} \right)^z.$$

In $r = \lim z \ln (1 + 1/z) = \lim (-1/(z+1) + \ln (1 + 1/z)) = 1$ by l'Hôpital's rule. $\therefore r = e$.

(Continued on page 64)

Career Appointments



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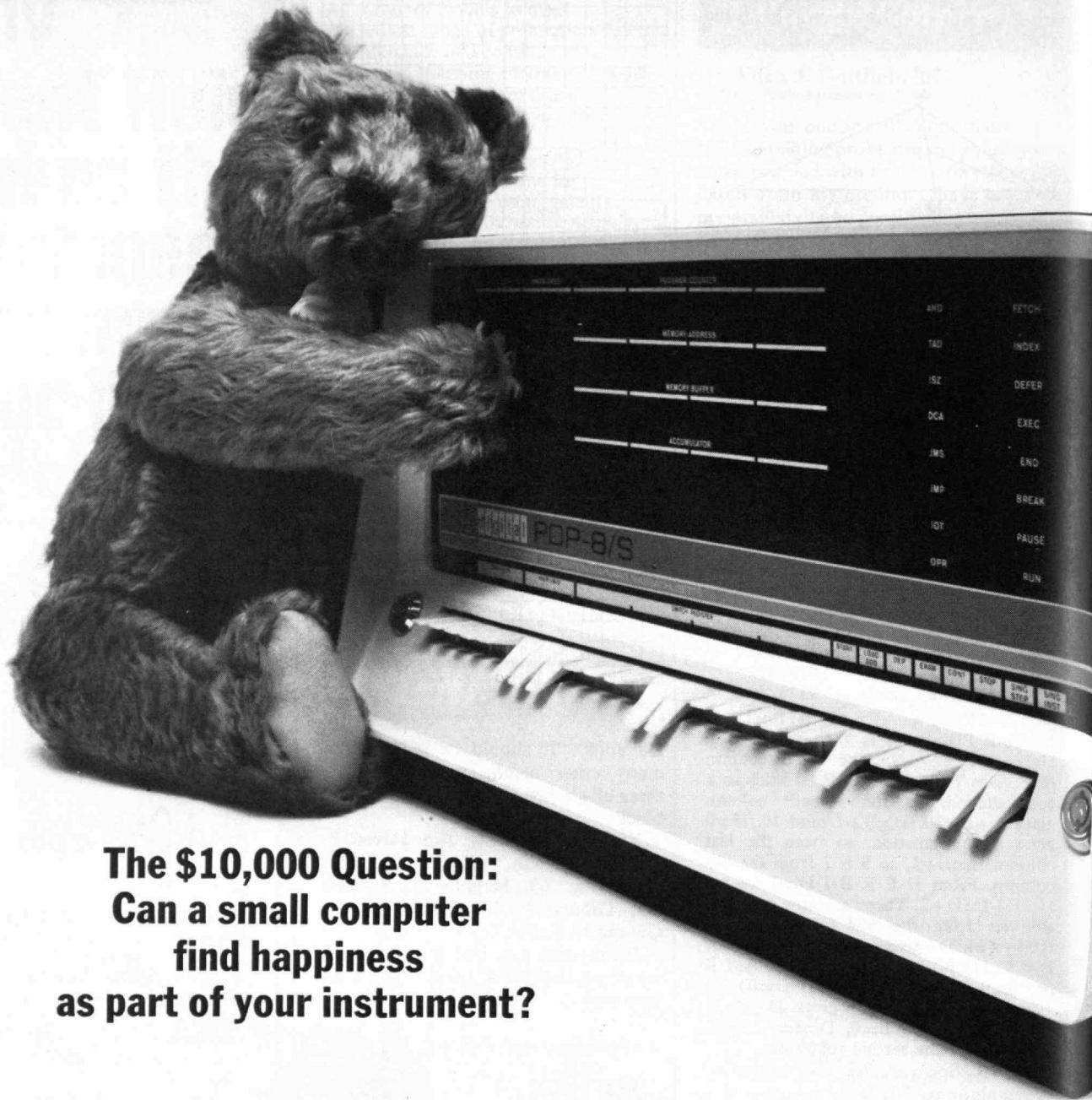
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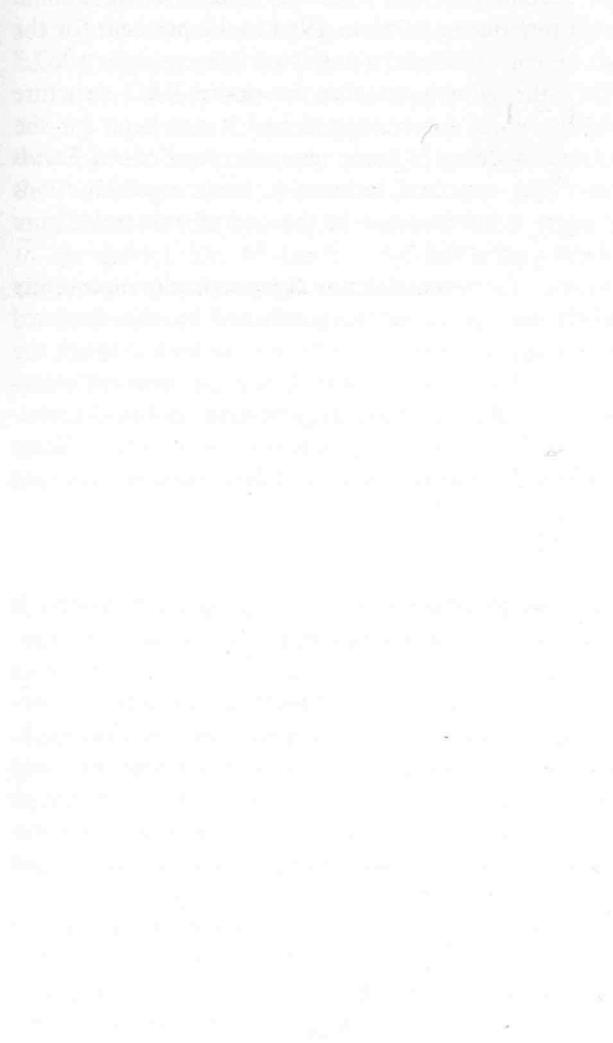


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R&D 1967: Focus on Man's Indignities

Apollo is off the drawing boards, and the Federal research and development mission is shifting ground

By Clyde C. Hall



Clyde C. Hall, free-lance writer and editor, serves as a sometime correspondent for *Technology Review* in Washington. Until 1964, Hall was for eight years Public Information Officer of the National Science Foundation. He is a member of the National Association of Science Writers, and his earlier experience included writing and reporting for the *National Geographic Magazine*, the Associated Press, and the *Boston Herald*.

One of the insistent questions in search of an answer across luncheon tables where scientists gather is: What is research to do after Apollo?

Or, alternatively: What will happen to Federal support of research and development after we get to the moon?

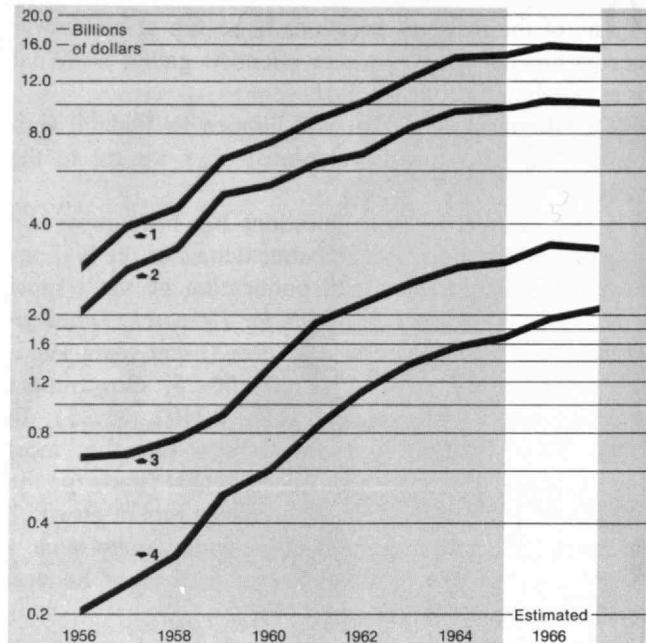
Sharp interest in these questions has been provoked especially by economists and statisticians of the National Science Foundation with publication of NSF's most recent edition of *Federal Funds for Research, Development, and Other Scientific Activities* (fiscal years 1965, 1966 and 1967, Vol. 15, NSF 66-25, Government Printing Office, Washington, D.C., 20402, \$1.25). In a discerning analysis, the report warns that the "most significant characteristic" of Federal R&D funds for the 1965-1967 period is a "sharply reduced rate of growth." Never before has the Foundation issued quite such a bearish statement about the flattening curve of Federal R&D support.

Search for reasons for this lugubrious outlook zeroes in pretty quickly on what is happening in the three agencies that account for about 85 per cent of all Federal funding for research, development, and R&D plant—the Department of Defense (DOD), the National Aeronautics and Space Administration (NASA), and the Atomic Energy Commission (AEC). Such focus, as well, illuminates still further the luncheon-table concern about R&D in the post-Apollo period. In fact, it turns the floodlights on it: in discussing trends in obligations, *Federal Funds* reports: "The combined research, development, and R&D plant problems of these three agencies grew at an average annual rate of only 3 per cent in 1965 and 1966, with a slight overall net dollar reduction expected in 1967. This decline springs mainly from prospects that NASA will sustain in fiscal year 1967 the first budget decline since its establishment in 1958, caused largely by the completion of some of the more costly development and construction work for its manned lunar landing program."

Although it is largely responsible for the declining growth rate in R&D funds, the drop in allocations for costly development and construction in the space program is only part of the fall-off story. The development component showed a decline in each of the three agencies—DOD and AEC as well as NASA. Together they account for 95 to 99 per cent of all development costs in the Federal R&D support program. Average annual growth for development was 4 per cent from 1964 to 1966—a steep drop-off from the 21 per cent registered in the 1956-1964 period. *Federal Funds* comments significantly, "The drop in dollar obligations for development scheduled for fiscal year 1967 is a prime cause of the leveling off of the R&D total."

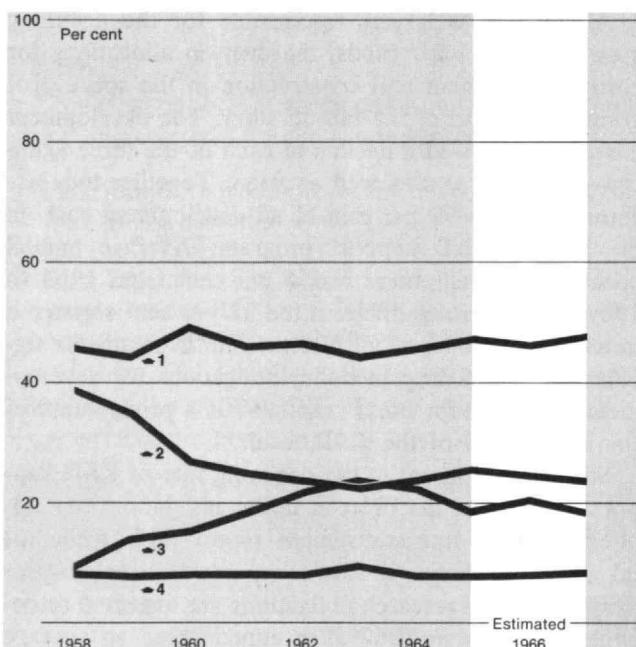
Still another factor in the declining rate of R&D support is found in the drop in dollar obligations for applied research. NSF statisticians report that "while total research shows a slowdown in the year-to-year growth, applied research obligations are expected to decline absolutely in 1967 after experiencing an average





- 1 Total
- 2 Development
- 3 Applied research
- 4 Basic research

- 1 Educational institutions
- 2 Federal government
- 3 Industrial firms
- 4 Other non-profit institutions



Trends in Federal obligations for basic research, applied research, and development are shown in the chart for fiscal years 1956 through 1965, with estimates for 1966 and 1967.

growth rate of 10 per cent from 1964 to 1966, compared with 21 per cent during 1956 to 1964."

Silver Lining: Basic Research

The bright spot in this otherwise cloudy picture is in Federal support of basic research. Its growth rate is slowing down, too, but not on the same fall-off curve on which applied and developmental components are skidding. The report notes that "compared with development, the rate of basic-research growth is slowing down more gradually—from a 29 per cent average annual growth rate during 1956 to 1964 to 11 per cent for the years 1965 to 1966 and a projected 9 per cent for 1967." In fact, the growth rate for the entire R&D structure probably would have stopped had it not been for the stout undergirding of basic research. As *Federal Funds* notes, "The expected increase in basic research funds will cause a net increase in the overall research figure in fiscal year 1967."

Neither the industrial nor the academic community is likely soon to be seriously affected by this flattened curve of support, but it may be well to look through the top of our bi-focals a minute, lifting our eyes off close-at-hand numbers to look at peripheral political-social-economic forces which squeeze out the numbers. Some intimation of their character and dimension is found, as well, in *Federal Funds*.

The clue to where research is going after Apollo is less likely to be uncovered in an investigation of support drop-off in the defense-space-atomic groups than in an examination of support increases for R&D in programs of all other agencies engaged in scientific work. While the rate of increase for DOD, NASA, and AEC was moving up at the ponderous rate of only 3 per cent in the 1965-1966 period, the rate for all other science-supporting agencies was climbing to a merry 19 per cent for the 1964 to 1967 period. Why?

In perhaps the most forward-looking paragraph in *Federal Funds*, NSF analysts have this to say: "The Departments of Agriculture, Interior, and Commerce carry out activities, some long established and some newly created, that relate to the better use of natural resources, to weather control, to problems of pollution and water supply, and to transportation. Other agencies are devoting increasing scientific effort to problems of urban living, poverty, and transportation, to name some major areas. There is an underlying growth trend, therefore, related to the Great Society and other public benefit programs, despite the projected net decline in 1967 that emerges from the fall-off in development and R&D plant support among certain programs of the de-

The chart shows the various performers' shares in Federal obligations for basic research for fiscal years 1958 through 1965, with estimates for 1966 and 1967.

fense-space-atomic energy group."

This was the most momentous part of the NSF report. The directions for tomorrow's R&D effort—as anticipated by NSF and presumably as advocated by the influential NSF spokesmen before Congress and in other Federal councils—are set forth clearly. NSF wants and expects more work on pollution, transportation (twice mentioned, probably because the new Department which absorbed most of the transportation enterprises had not then been established), urban living (will funds be appropriated for "demonstration cities"?), poverty, health, education, human behavior and motivation.

The Nintieth Congress

Then came November—and separation from their seats in the House of Representatives of nearly 50 members of the party of the Johnson Administration whose votes were nearly always cast to support so-called Great Society legislation. Typical was the defeat of Weston E. Vivian, '49, comparatively young Democrat from the Second Congressional District of Michigan, the only science Ph.D. in the House. Of some 130,000 votes cast in his district, Dr. Vivian lost by less than 3,000; by admission of responsible members of the Committee on Science and Astronautics, the House lost an "irreplaceable" member, the scientific community an articulate defender.

What will be the extent of damage to Great Society objectives as a result of the loss of Dr. Vivian and others who usually voted "aye" on Administration measures?

Professionals whose business it is to counsel the President about the objectives of Federal science and engineering discount the likelihood that the new Congress will block progress. Spokesmen for the President's Office of Science and Technology arch skeptical eyebrows at the suggestion that new members will raise barriers to slow down still further the rate of increase in R&D support. They take the position that mounting problems associated with pollution, transportation, health, and education will be viewed with no less concern by the new as the old Congress, and so they believe support of corrective legislation will not be withheld. Further, they insist that emphasis be placed on the fact that *Federal Funds* did not show that Federal R&D support had declined, but merely that the curve of the rate of incline was leveling off. Maintenance of the rate established for the 1956-1964 period, they point out, could not be tolerated under any circumstance.

All observers—professional and amateur—agree that Federal support of the R&D enterprise is trending away from emphasis on physical and toward strengthening biological and human sciences. A foretaste of the bias has already been observed in the embarrassment of riches with which Congress frequently endows the National Institutes of Health—much to their dismay, because the resources of trained manpower are often not adequate to sustain competent research. Wise performers of Federally supported science and technology should nevertheless take careful note of the shift away

from physical and toward life sciences.

Changing R&D Missions

Performers, of course, are four—the Federal Government itself in its own laboratories, industrial firms, educational institutions, and other non-profit institutions including private foundations. Federal contract research centers administered by industrial firms, educational institutions, and other non-profit institutions (example: M.I.T.'s Lincoln Laboratory) are a special category of performers of relatively recent vintage. Because the growth rate of the basic-research component continues to rise, colleges and universities are likely to feel hardly at all the general R&D slowdown. But the retardation in applied and developmental components means that industry and contract research centers may begin to note the difference and should perhaps be prepared to adjust their missions. On the subject of adjustment, *Federal Funds* notes significantly: "Relative levels of support may tend to shift somewhat in the future as the social and psychological sciences attain greater scientific and public recognition. Present programs put emphasis on education and social adjustment, on problems of urban living and area development, and on the total life and behavior of man. Between 1956 and 1966 the social and psychological sciences combined have shown a 27-per cent average annual growth rate, compared with 20 per cent for all the other sciences combined. For 1967 they are expected to grow an additional 17 percent. Starting from a smaller base, their rate naturally tends to be higher, but the direction of the trend is clearly established."

Despite the fact that today's society is not in a contemplative mood, apparently it wishes it were. Quick reaction is one of incredulity in the face of evidence that R&D support is moving in the direction of demonstration cities, transportation, human behavior. Are we building false fronts to hide the ugliness of the Vietnam war? Shall we let the Soviets beat us to the moon? Answers to these and similarly pressing questions are probably affirmative—yes, we are weary of the war and of the oppressiveness of Soviet intransigence, but our social philosophy is grounded in the dignity of man and we are going to get on with the job of preserving it—come hell or Ho Chi Minh! (Speaking of the Soviets, some report that the reason for the ominous quiet in their space program probably is the fact that they are preparing a whammy spectacular—moon landing?—when later this year they observe the fiftieth anniversary of the Bolshevik uprising.)

Small wonder, then, that much luncheon talk in Washington centers on: After Apollo, what? From this side of the table, it looks as though some answers can be found in *Federal Funds*, reflecting the will and determination of this nation to put an end to the indignities to man caused by disease, impure air, unclean water, clogged highways, slum dwellings, crowded ghettos, and unequal opportunities in education.

“ . . . A Simple and a Plain Delight”

Use the optical instrument in
this issue to find a true
understanding of the nature of science

By Philip Morrison

“ . . . We inherit much from the cultures of the past. The influence of Greek science and philosophy, of Roman law, of religion having a Jewish source, upon our present institutions, our beliefs, our ways of thinking and feeling is too familiar to need more than mention. Into the operation of these factors, however, two forces have been injected which are distinctly late in origin and that constitute the modernization of the present epoch. These two forces are natural science and its application in industry and commerce through machinery and the use of non-human modes of energy. Science has brought with it the radically novel conception of physical nature and our relation to it. This new conception stands side by side with the conception of the world as a heritage from the past. The things of the physical world and those of the moral world have fallen apart while Greek tradition and that of the medieval age held an intimate union, the union accomplished by different means in the two periods. The opposition that now exists between the spiritual and ideal elements of our historic heritage and the structure of physical nature that is disclosed by science is the ultimate source of the dualisms formulated by philosophy since Descartes and Locke. These formulations in turn reflect a conflict that is everywhere active in modern civilization. The problem is so acute and so widely influential that any solution that can be proposed is in anticipation at best and realized only by the course of events. Scientific method as now practiced is too new to be naturalized in experience. It will be a long time before it so sinks into the subsoil of the mind as to become an integral part of our corporate teeth and attitude. Until that happens both its method and its conclusion will remain the possession of specialized experts and will exercise their general influence only by way of external and more or less disintegrating impact upon belief and by an equally external practical application. . . .”

This passage, written by John Dewey 35 years ago in *Art and Civilization*, is a brilliant foreshadowing of the

problem of our times. To understand it is now the necessity imposed upon an institution such as M.I.T., largely facile and familiar with the methods, conclusions and spirit of the scientist, upon the people who bear the mark of the institution, upon our country which more than any other country has entered the age of the application of science.

This kind of “watering of the subsoil” cannot, I think, be restricted to a tiny garden of elite because if that happens, the desert people who surround such a patch of green will neither support the dreams of those who water the Tree of Knowledge, nor will they allow fruition to anything but a terrible and ugly future. I also believe that unless this does become part of the practice of science itself, the very growth of science will be so fragmented, so specialized, so nonintegral, so lacking in appreciation of the roots, the traditions, upon which it grows that it itself may become the quasi-mechanical application of specialties; and the richness of science will fall victim to the machine, even in the scientific field.

I am concerned that we do not substitute for this “watering of the subsoil” a mere sprinkle on the surface which is to produce a kind of new verbal myth, a mythology founded on the statements of authoritative people, illustrated beautifully in four colors in the magazines and the textbooks, but neither genuinely grasped nor made a conscious part of the feeling and beliefs of the people who learn it.

If you ask people if the earth is round, most people would be a little insulted; but in spite of the fact that our satellites go around it, there are still quite a few people who feel uncomfortable about the earth being round. They know, but they don’t quite believe. We need—for this as for all of science—to seek a sense of human oneness and rightness—a sense that is largely intuitive, in present scientists, artists, engineers, and in all creative persons who know well enough what they’re doing.

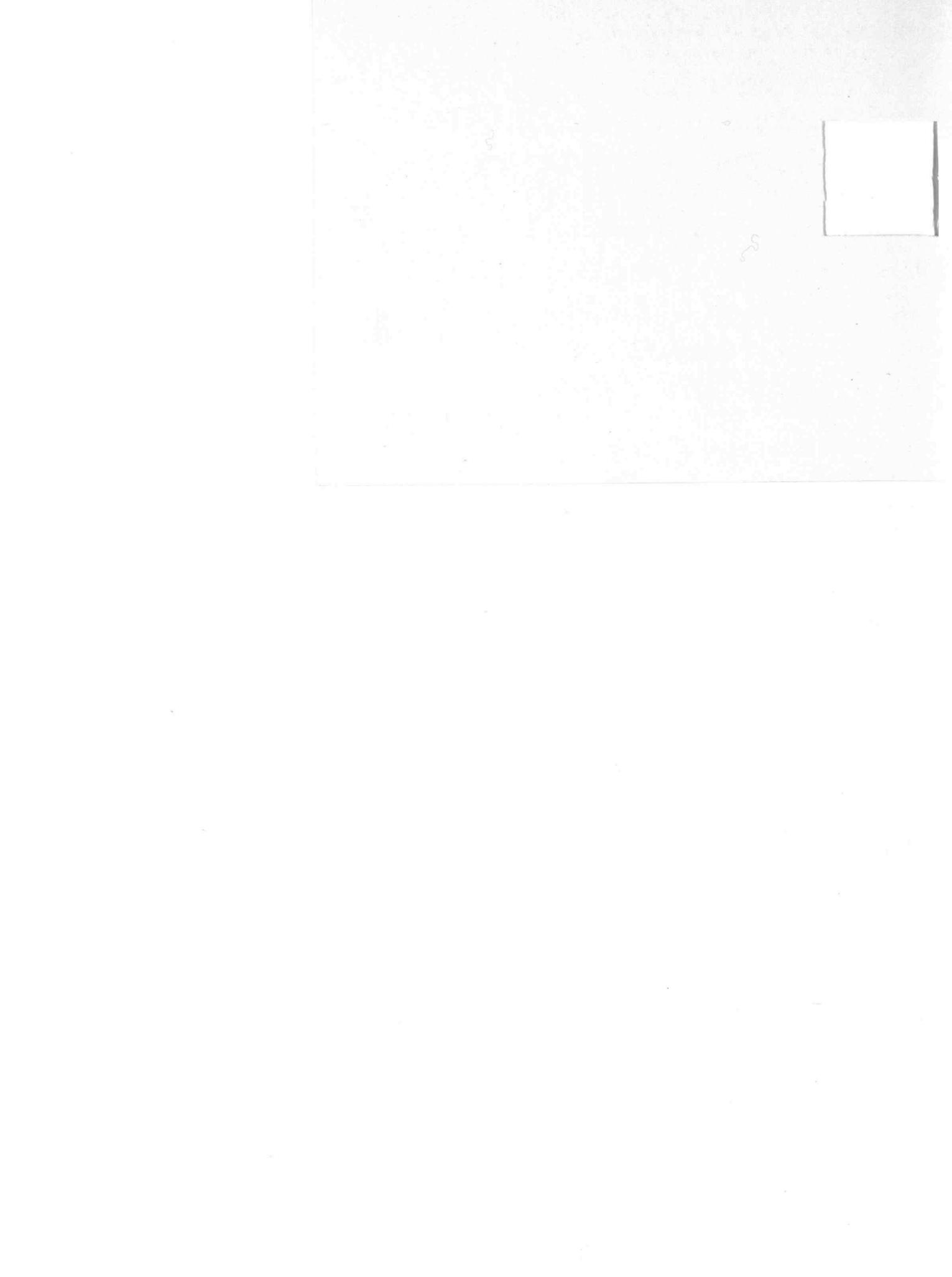
In achieving this, we have to face two problems: our teaching about science is often genuinely false, because compellingly to demonstrate the asserted fact is beyond the skills of the people who do the work, or beyond the time allotted and the effort available; and then we substitute for the real thing not only the new verbal myth, but the verbal myth put in a general and apparently abstract form—spoken in a symbolic language so powerful, so rich, indeed, that it can correctly embody all our experience. But with the roots from which it grew hidden, without the landscape around, people learn only that verbal formula. Often this verbal formula is so abstract and so disparate from everyday experience, that people learn it thinking that this is what they ought to learn, but in fact doubting it internally.

This is especially clear once you inquire of “honest people”: people under 10. If you ask them whether the sun moves around the earth or the earth moves around the sun, they know the answers for sure. But if you can gain their confidence, they’ll tell you that of course, that isn’t our sun, because you can palpably see during the

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This card is a small piece of optical apparatus, provided so that
readers of Technology Review may join Professor Philip
Morrison's explorations of "a simple and a plain delight."
Remove it carefully from the magazine, keeping it flat, and use it
as you read his article in Technology Review for January, 1967.



day that the sun is moving. The earth is moving, they know; the moving sun is what they really see. So they come to believe this is one additional gambit of that great game of deceiving teachers by telling them what they want, so characteristic of examination passing.

On a more serious level, consider the famous Third Law of Newton, which is indeed a deep principle of mechanics. We always represent it in a most elementary form, by saying that action and reaction are equal and opposite forces. The uniform reaction of a large class of persons is that this leads to an absurdity: they are asked to believe that when I actively push on the wall, the wall—that inert, dead object—is actively pushing back at me. They just don't believe it. Having heard the physicist insist on the point, they conclude that physics is not for them and they are not for physics. Physicists they perceive, have some kind of abstract machine they deal with which is not the real world at all. It is at exactly such junctures that a large number of intuitive, intelligent people, especially among women, go away from science and have nothing more to do with it.

This is not to say they are foolish, by no means! What it says is that, as usual, they have out of experience and intuitive insight a richer understanding of the situation than do the elementary school books which reduce the marvels of statics down to trivial statements of the Third Law. Because, as a matter of fact, you know very well the wall is not inert; were it inert, it would not do what you say. The wall has to acquire an elastic stress by deformation. It is quite clear that if you sum up mechanics by this Newtonian scheme without showing what it implies in any degree, you give people a sense, not only of a myth which is beyond them, but also of abstractions which clearly have to do with a world they do not see.

I am, of course, not speaking against abstraction, against pedagogy, against rigorous treatment, or against the textbooks. All of those are admirable elements of a mixture, but they must remain, as I think they remain for nearly all productive scientists, only parts of a mixture, not elevated enormously in order of priority. Our traditional view has been that the important thing is to learn the theorems and the textbook demonstrations, and a less important thing is to be able to apply them, and a still less important thing is to see them working in the real world, and a thing least of all important is to form an intuitive judgment of when and how they should be used. I believe that in reality hierarchy for growth in any subject is exactly the other way around for most people.

Bound into this issue of *Technology Review* is a small piece of optical apparatus, a proper scientific instrument of a rather elementary kind. But it is by no means a trivial one, and I want to use it to give those of my readers who have studied optics a chance to work in the theory of aperture stops. Those who are not so far advanced can use it to study the theory of optical in-

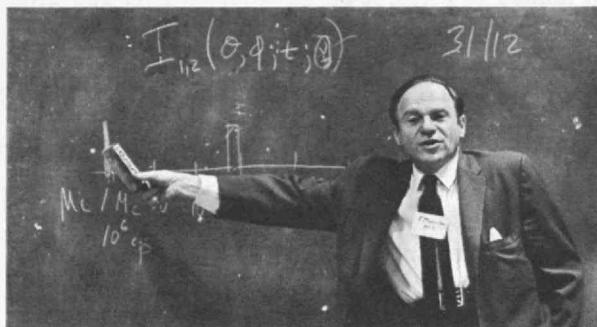
strument design. This piece of apparatus is important because it is simple—we can bind it in a magazine, you can carry it in your pocket, you can make an even better one at home with a small piece of silvered glass. It is not limited to a restricted environment; we can give it away with no great sense of charity. It is cheap.

Nor is it something symbolic, a diagram or a Greek letter. It is a concrete piece of the real world. It is a small, elementary version of an aperture stop, but it is as genuine an aperture stop as exists in the entire universe. The same thing is (almost) true about the reflector: it is, within the limits of thick paper and metallic foil, a plane mirror. The aperture stop and the mirror are put in the same package for convenient handling.

The point that you have the concrete materials in front of you is not trivial. Naturally, you are not "discovering" the aperture stop or the plane mirror. Many years ago, people discovered these things and learned how to make them; they were great people. In this case we have really short-circuited all that lengthy discovery process—the most difficult part of science. Anyone who does research knows that by the time the apparatus is set up, doing what it's supposed to do, the really difficult job is finished; the data-taking may be interesting, but it's not the major task.

You have before you the two simplest optical instruments known to man—the clear aperture and the plane mirror. Now take the aperture—rather, either one of the instruments—and examine the field of view; try various fields of view. See what it's like. (The larger the room, the better research you can do.) You can adjust the field of view of your aperture so that it takes in a whole wall or only a book on the desk, a large area or a small area, a large or small field of view. Naturally, if you were doing this in a more pedagogical context, you would probably have a notebook and record your findings. But in any simple enough situation you can rely on your memory to guide you to the scheme. You will soon find a way which you are sure will give you a large field of view, and also a way which guarantees you a small field of view. The aperture is exactly as transparent either way, but you are finding something out about an aperture system, something intrinsic to it which controls the field of view.

Now having done that with the clear aperture, can you do that same task with the mirror? (Keep the mirror flat. Press the card against a book, perhaps. Of course, bending it is wonderful, too. But then you will enter on a still richer study: curved mirrors. Remember Palomar—and progress slowly.) Can you give the mirror a big field of view and a small field of view? (Of course you do not see the field behind the mirror; you see it in the other direction, for that's the nature of the mirror—to turn something around.) This is not something that people who are inexperienced in optical matters could be expected to do in three minutes. Clearly, this is something you could afford to experiment with. As you do so, you will notice a regularity, a similarity, a special relationship between the two kinds of instruments of a



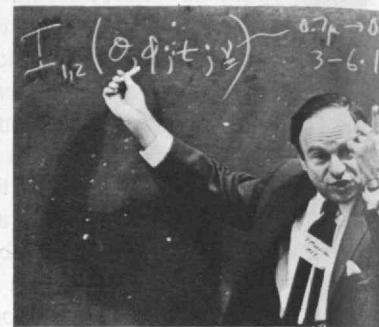
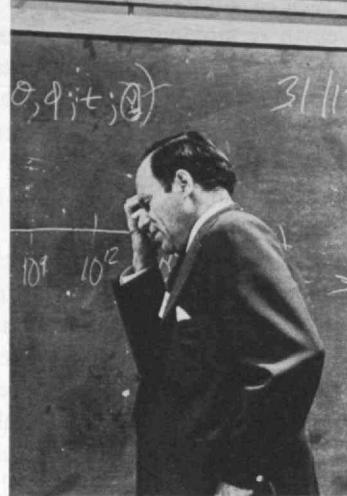
PHOTOS: MAJOR MORRIS FROM EDUCATIONAL SERVICES INCORPORATED

"I am concerned that we do not substitute . . . a mere sprinkle on the surface which is to produce a kind of new verbal myth, a mythology founded on the statements of authoritative people, illustrated beautifully in four colors in the magazines and textbooks, but neither genuinely grasped nor made a conscious part of the feeling and beliefs of the people who learn it."

given size. They view in opposite directions; but as far as the field of view relationships go, they are the same. Here is something rather important; you may not yet recognize the rules of reflection in that statement, but they are there. For you have discovered that a plane mirror can be described as an aperture, a window into the looking-glass world, which is a world almost like our world but located behind the mirror. It has the same depth and size as our world, in accordance with a famous theorem of geometrical optics. You have come pretty close, not perhaps to establishing that theorem, but certainly to rendering that theorem plausible.

If you will go farther, including a little bit of measurement, you will very soon convince yourself that the world behind the aperture and the looking-glass world, each looked at through a square opening, repeat precisely the same geometry. This striking result is of course implied by saying the card is opaque, plus the statement that the angle of incidence is equal to the angle of reflection and the two rays lie in the same plane. That is a great deductive statement from which all this could be derived.

If you truly understand that pithy phrase and know what it means, if you have handled mirrors and aperture stops, you have a basic foundation for work in optics. But if you simply memorize that phrase and have not the experience to understand it truly (which is characteristic of all too many students and their teachers), then when you want to use it to understand the world, you are not sure. Is this one the angle of reflection, or this one, or that angle? What does it mean? The memorized principle becomes a kind of single, narrow path through a wilderness of the unknown, a narrow framework in which to interpret mirrors. It does not prepare you for the world of aperture stops. It does not prepare you for the mirrors that are used up and down the corridors of M.I.T., in lasers, as telescopes, in folding beams in focusing, in all sorts of directions. Nor does



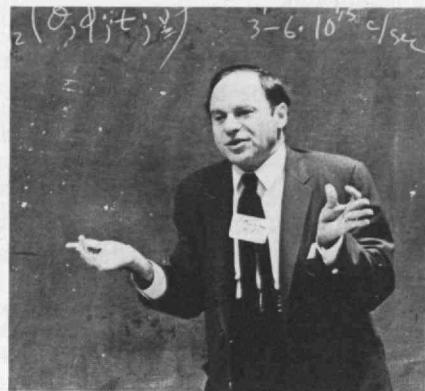
it describe men and their relationship to mirrors. Human beings' relationships with mirrors are much richer than either description would give.

There is another inadequate description, too. It is that of the psychoanalyst, or in general, the student of human motive. We might say—indeed, he often has—that men use mirrors to gain a self-image, to study that most fascinating of views, oneself and his appearance before the others. Of course men—and women—do; we too have read of Narcissus. But where are Palomar and lasers in that? Perhaps they are there, implied as in the bareness of the mathematical theorems, but they are far from demonstrated.

Let me set you problems which you can now work out for yourself, to test what I am trying to say. What is the smallest size of plane mirror in which it is possible to investigate one's self, one's image from head to toe? How far away must you be from that mirror? What is the over-all geometry?

You can make a little kaleidoscope out of two of these cards. You can also make a periscope out of two of them. Why is the mirror square so bright and silvery, while the aperture is dark? The world is full of mirrors, always giving rise to and repeating the same relationships, the same geometry. Mirrors are also found in the landscape. Have you noticed the windows flash up in the sunset? Why does this appear only when the sun is setting low in the west? What kind of a pattern does that reflection make? Is there a narrow band, just a few windows which do the job? And why, what does this mean? It is quite possible for us to judge, for example, the mean age of the houses that you're looking at, and it's also possible to tell the socioeconomic status of the average house from this reflection. All this has to do with the same story, the story of how a flat glass lets you look into the world behind it.

Water is another kind of natural mirror. Sometimes the water is dead still and it makes itself into a mirror



like the glass. Then you can ask yourself the question: Does the reflection look exactly the same as the object? Colors? Contrasts? And if not, why not?

Ripples in the surface of the water widen the reflection into a ripple pattern, a path along which the sun's setting or the moon's rising makes an illumination. Young people who have some feeling for the structure of reflection can come pretty quickly to form an opinion about what is going on. They can see a regularity, a subtle kind of order in the world which is never seen by those who do not have this set. This modest law, in a way unimportant, is in a way touching what is characteristic of science.

There are, certainly, minds who would find an elegant deductive statement more powerful and valuable than the kind of richness and applied view I have been trying to suggest. But generally, learning requires a context—sometimes a complex context—which is involved with seeing, with feeling, or, still better, with having to make the thing in the first place and notice what goes on, what the tolerances are. This is where one has that great sense of preparation for science which is characteristic of the workshop and the hobbyist. Now clearly, this is not found in mere craftsmanship. For science you must pass beyond craft. You must not only make the material do your will; you must think rationally, you must form principles in some semi-symbolic way, even, if necessary, changing the procedure you were taught. You must try to make procedures which reflect your own understanding, to give you a new or different way to gain the end. The true craftsman will learn to carve; he will practice it all his life, looking at the goal of the carving, and never at the stroke of the knife. A more analytic, a more reconstructing kind of activity, is characteristic of the scientist. I think a merger of these is what is indispensable.

Education is presently well equipped to teach us the importance of words and symbols. What has been very

much under-estimated, but what is I think of dominant importance, is this kind of simple activity which can be carried on at all levels—from handing out a laser to using something like a card and a piece of mirror.

In short, what I'm speaking for is something which the linguistic scholars know very well. Linguists say that one characteristic of knowing a language is productivity. Productivity does not mean the number of words uttered per day. Productivity for them means the ability to create and understand new sentences, sentences which combine already known elements in new ways. Nobody knows a language who cannot do that at some level.

What I would like to do is extend that criterion very far into all of learning, to show what real learning means, what the "subsoil of the mind" requires of science. I want to instill into every person as widely as possible and as long in life as possible, from the earliest to the latest stages, some level of productivity, some ability to recombine elements that he knows to make something new for himself which he has not known before.

One studies science in the end because it can become and remain at all ages, in all branches, to all conditions of humanity, a simple and a plain delight.



Dr. Philip Morrison is a distinguished theoretical physicist whose interests range from cosmic rays and astrophysics to science education and the impact of science on current political and social affairs. He came to M.I.T. as professor of physics in 1964, and he has been active in the work of the Physical Science Study Committee and Educational Services Incorporated since their inception.

How to Study Science: A Pendulum at Home

The simplest of physical devices,
fully and fruitfully exploited,
can give a true taste of science

From Educational Services Incorporated

The word pendulum originally meant "thing that hangs." For most of us it brings forth visions of clocks or of great swinging museum pieces which somehow prove that the earth goes around. But the simplest pendulum can be a powerful tool.

Some of you have studied physics in school, others not. We will call one group of you Physicists, the other Innocents. Each has an advantage and a disadvantage. The Physicist has some grasp of the physical principles involved in the pendulum, but he often tends to over-direct, lecture, and explain prematurely. The Innocent's observations and questions are more like those that children will develop; and in science, as elsewhere, the questions come before the answers. Both groups have much to learn.

We believe that the pendulum should be studied first in the laboratory way which is demonstrated on the next pages, without textbooks and without detailed guidance. Different investigators will notice *different* phenomena, raise *different* questions, and travel for quite a time in *different* directions. *This diversity is basic to our whole conception of the study.* For some time, however, it may have the effect that experimenters, both Physicists and Innocents, are not immediately interested in each other's investigations and are not ready for discussions. In the fullness of time, however, experimenters will build trails that cross and recross each other, and a fund of common experience will develop.

In this interim period a further question—about experimenters' language and the language of science, with its special distinctions and technical terms—will probably arise. It is a mistake, we think, to introduce technical terms before the phenomena have been *thoroughly* seen and enjoyed. Words like "energy" and "momentum" are linking words. They acquire significance in unifying the discussion of many superficially different sorts of physical phenomena. Isaac Newton got along very well without "energy." We hope only to lay some secure foundations for later understanding, and have therefore avoided most of the language of physics. The new adult or

scientific words come easily when the ideas behind them have been developed. Otherwise, they often only breed confusion.

"What is a pendulum doing when it is not doing anything?" This is not an idle question, but it is a question that might be brought up idly, as a probe. There is a primitive answer that makes the question silly: "Nothing." But there is another answer, learned mostly from talk and books, and not often felt as direct and personal knowledge; it is the answer of one boy who looked at his teacher, slightly startled and then pleased, and said,

"Toward the center!"

Through some hours of work, of personal investment, we think, the pendulum had come alive for this boy. Suddenly it was as though the great sphere of the earth, formerly an abstract thing of words, pictures, and maps, became as palpable as the tiny steel ball that it tugged on and the support and fish line that tugged back. His answering question came the next day:

"Does everything have gravity?"

He was probing, we weren't sure for what. Not to out-distance him, the teacher questioned the question:

"If I let go of this eraser, what will happen?"

"Oh, I know, the earth pulls on it," he said, "but does *it* pull on the *earth*?" And after some further probing. "Does one ball pull on the other ball?"

In these questions, we saw the mind of a physicist at work, made ready by his previous work and released by an "obvious" question; along a path of his own making, he had come to question what had seemed obvious. With real respect, the teacher found and gave him an account of the famous Cavendish experiment, which measures the gravitational pull between two metal balls in the laboratory. There was a further step, which we relate to show consequences, on a later day:

"You know, I really don't understand why the planets don't fall to the sun."

The teacher gave him no easy answers, because there are none at this stage, though there are easy words that pass for answers.

We are not after "explanations" in this study of the pendulum. We are after an easy familiarity and involvement that comes from experience, and the beginnings of some important ways of looking at physical processes. There is no point in aiming at "explanations" until the ideas involved in the explanations are well established. Thus, if you are relieved of this pressure to learn "what scientists say" about something complex, you can simply enjoy watching and manipulating, at the level of "Look what it's doing now!" or "What will happen if . . . ?" Some of us, with backgrounds in physics, have learned more about this subject, which we thought we understood, by watching through children's eyes than we would have supposed possible.

This article is based on material prepared by David Hawkins, Eleanor Duckworth, Edward Prenowitz, and other members of the Elementary Science Study of E.S.I. The photographs are by George Cope and Joan Hamblin. A trial teaching edition of a longer work on pendulums is now available from the Webster Division of McGraw Hill Book Company.

A Note on How to Begin . . .

Pendulums are obviously easy to build. A string with a free-moving weight hanging from a doorjamb is a simple expedient. Before long you will need a second pendulum beside the first one. And you will want a way to vary the length of the string and the mass of the weights.

A pair of tongue depressors may be the simplest pendulum anchors for many households. Use a razor blade to make a $\frac{3}{4}$ " slit in one end. The thread is wedged tight in the slit, and the other end of the tongue depressor is attached to a desk with masking tape. A pair of these taped about 8" apart on a desk provides two pendulums to work with. The length can be adjusted by pulling the thread through the slit.

This tongue depressor version has an important advantage; because the thread is held tight in the slit, the pendulum precesses less than it does when the thread rubs in a small hole.

Your own resources may determine what you use for weights. If you use glass marbles and steel and Ping-pong balls as we have done, eyes may be attached to them with white epoxy glue. Wooden weights with screw-in hooks may be easier. The best thread to use is 9-pound braided nylon fish line.

A soda straw or a piece of paper rolled tightly from corner to corner makes good rigid couplings for coupled pendulums. Quarter-inch masking tape, or thread attached by masking tape, is good for soft couplings.

It would be presumptuous to tell you how to start, for there are many ways into this subject. With almost no discussion, you can arrange the materials from which to make pendulums and begin the study with the simplest games. In general, children's first trials will involve swinging the weights through wide arcs and starting them with a push, and the weights may often bang into a support or fall off. After a time, the approach will become more careful, the swinging not so wide or wild. This means that the sheer enjoyment of motion and banging around is being replaced by more discriminating interests.

For a curtain raiser with a family group, you may want to attempt some amateur magic. Start off with a pair of demonstration pendulums, of which all but the weights are hidden behind a screen. The screen is simply a piece of cloth or paper fastened so as to leave the weights visible. (A background of contrasting color helps.) Behind the screen are two pendulums joined a few inches from the top by a single thin stick or soda straw. This is done by wrapping each string around the end of the straw or stick, or slitting the ends and inserting.

Move one weight a few inches parallel to the stick and hold it with one hand while you stop the motion of the other weight with your other hand. Now release both and watch. What is happening?

First one hand, then several. "Magnets!" "The wind?" But say what you see, at a quick look or after watching for one or two minutes; never mind the explanation. The description comes out, all at once or bit by bit. "They take turns swinging," is the consensus. And now to the why's. Invariably someone says, "Magnets." The magician, enjoying his role by now, might lower the stick a couple of inches and repeat. What has happened? "You made it stronger!" The Physicist says, "Electromagnets—you turned it on stronger." What was the difference? "It went faster!" What went faster? Listen to the language here, but don't try to improve on it until everyone feels the need, which will happen in good time.

Very well, what about this? The magician now removes the stick unseen. Dramatically, he repeats the experiment, only now the released pendulum swings on while the other sits undisturbed. "You turned it off," says the class scientist. Every magician has his own tricks, and we won't try to finish the account. One thing is sure: when the unveiling comes, everyone will see the stick.

This is not trivial; without the trick of concealment, children and even adults often fail to see what is right there in plain sight.

During the demonstration, there will have been some descriptive language from the "audience." At first one ball is swinging, but not the other. The second starts to swing and, after a bit, the first one stops swinging. Then the first ball starts to swing again, and soon the second has stopped.



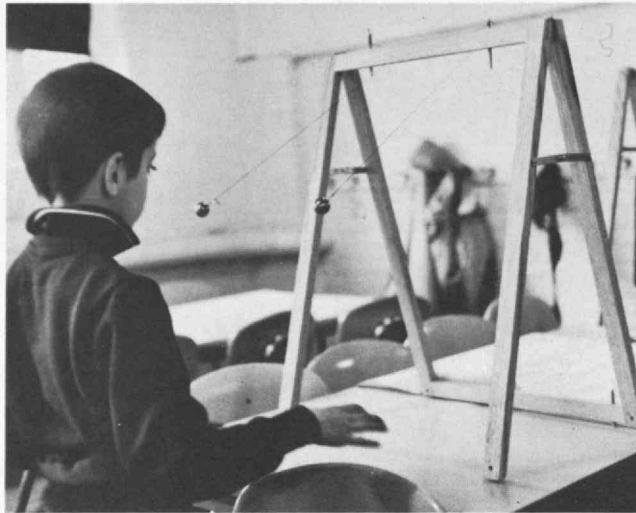
The process of swinging is being transferred, passed back and forth, from one pendulum to the other.

If you are a Physicist, you may want to say that it is "energy" that is being transferred, but that is not all that's involved. Approval gives the audience license to use the word *as though it were an explanation*, without knowing which aspect of the transfer is properly called "energy" rather than "momentum" or what not.

"Energy" doesn't tell you how the pendulums are swinging, or how one is affecting the other. It doesn't tell you what to expect if you raise the stick or change one of the weights. Using the word often seems to steer people away from a closer look at the pendulum. Some people will say "it" is passed back and forth between the pendulums. "It" seems a safe word to use, to suggest the bare beginning of an idea like energy.

Now is the time to turn the apparatus over to the audience. If children start with the coupling, you can count on a good deal of playing to begin with. Sticks slip off; soda straws get bent; the strings may not be the same length. But what happens when the straw is bent? when the stick is slanted?

The interest in the pendulums when they are coupled together may, without any forcing, grow into a curiosity about the behavior of weights swinging independently without a coupling, and this opens the whole realm of pendulums for action and thought.



"Can you make two pendulums stay together when they swing?"

Sometimes two pendulums will be so nearly the same length that they appear to swing together for 10 swings or 20, but the discrepancy gradually becomes visible.

In the process of adjusting two pendulums to stay together, the effect of varying the length becomes familiar. Most people will soon understand that the shorter one "swings faster," "getting ahead" of the longer one. But there are other variables, such as the width of swing and the weight of the bob. These are often very surprising in the effects they do *not* have as well as those they do have.

These variables will not all be sorted out at once, and you need not expect them to be. When a variety of weights is available or when several weights are hung on one string (if you have them around, it will happen), we have the effects of weight and shape (and length too, sometimes) together—but the sorting may come much later. If the length of the string is the same, does a wide swing take the same time as a narrow swing? The answer is a first-rate discovery. According to an imaginative biographer, Galileo found the answer by watching the swing of a chandelier in a cathedral.

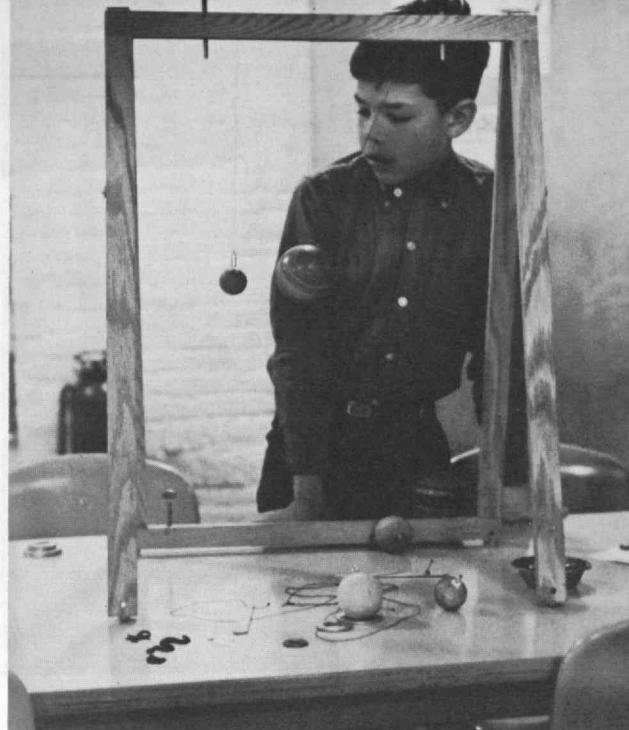


No one is much surprised that the width of the swing will slowly decrease until the pendulum swings no more (or very slightly). But this is the sort of knowledge you can't count on. Doesn't the clock pendulum keep on swinging? One child has said that the pendulum in the science museum just "keeps on swinging" and "that proves the world is round."

There are many ways of investigating the loss of motion of a swinging pendulum and the factors affecting it. Will the motion die down faster with a light ball than with a heavy ball? Let's try a very light weight. (A Ping-pong ball?) Or suppose you put paper wings on a heavy ball or surround it with cotton like the cotton-candy cone at the fair. What about the thickness of the string? Try different sizes. In the other direction, what will happen if the pendulum is very heavy, such as a brick swinging from a ceiling support?

In discussion, someone is likely to say "friction." We wouldn't like the word to replace "pushing the air out of the way" (that is real insight—many people don't have the feel of air as something real that pushes or has to be pushed) or "bending the string." "Friction" is a linking word, like "energy," and it has meaning in science because there are so many kinds of forces in our world that inhibit or dissipate motion. Without all the links to other instances and kinds of friction, the word adds very little.

This same phenomenon can be approached from another point of view. Attach a stick or ruler behind the pendulum. Pull the ball back until it touches the ruler, and let go. Will it ever come back and hit the stick? Nearly? How far will it go on the other side? (We tried to say, "before it *stops* on the other side"; confusion! "It doesn't stop." The ordinary English is not adequate here. Some of us remember questions of this sort from childhood, never dealt with in the books or lessons. What does the ball do? A young friend said, "It stops, but it *isn't* stopped. it doesn't *stay* stopped.")



Weight is one of the first factors that people want to look at more closely. Some suppose that a heavy ball will swing much farther out on the other side when released than a light ball released from the same place. Most are quite sure that the strings must be of very different lengths if two balls of different weights are to swing together—though they disagree on whether the heavy weight should be on the shorter or the longer string!

After the first trials with heavier and lighter weights, there will still be a lot of disagreement about whether or not weight makes a difference. This is in part because there are a lot of questions in which it might make a difference: how long a pendulum keeps swinging, how fast one swing is, how the coupled pendulums swing.

It is a most surprising fact, full of significance for an understanding of the physical world, that a change in the weight of a pendulum does not affect the time it takes to swing back and forth. We trust that you have investigated this problem yourself. (It is possible that this surprising fact will not be observed or credited. In changing the weight on a pendulum, experimenters may also change its shape, size, and length: for example, substituting a *big* weight for a *small* one.) One method of study, a little crude but nice as a technique, is to count out loud in time with a single pendulum, change the weight, and count out loud again. Most of us, adults and children, have a very accurate ear for changes in tempo.

One boy had assented, with the rest of the class, to the statement that "weight doesn't make any difference" to the round-trip time. Many lessons later, he adjusted the lengths of two glass-ball pendulums so the shorter one did 20 swings while the longer one did 10. In his joy at having done this, he wanted to push it to the limit. He replaced *one* of the glass balls with a steel one. The 20 to 10 still held! He was amazed, and bouncing with delight. He finally had learned: Weight *really* didn't make any difference.

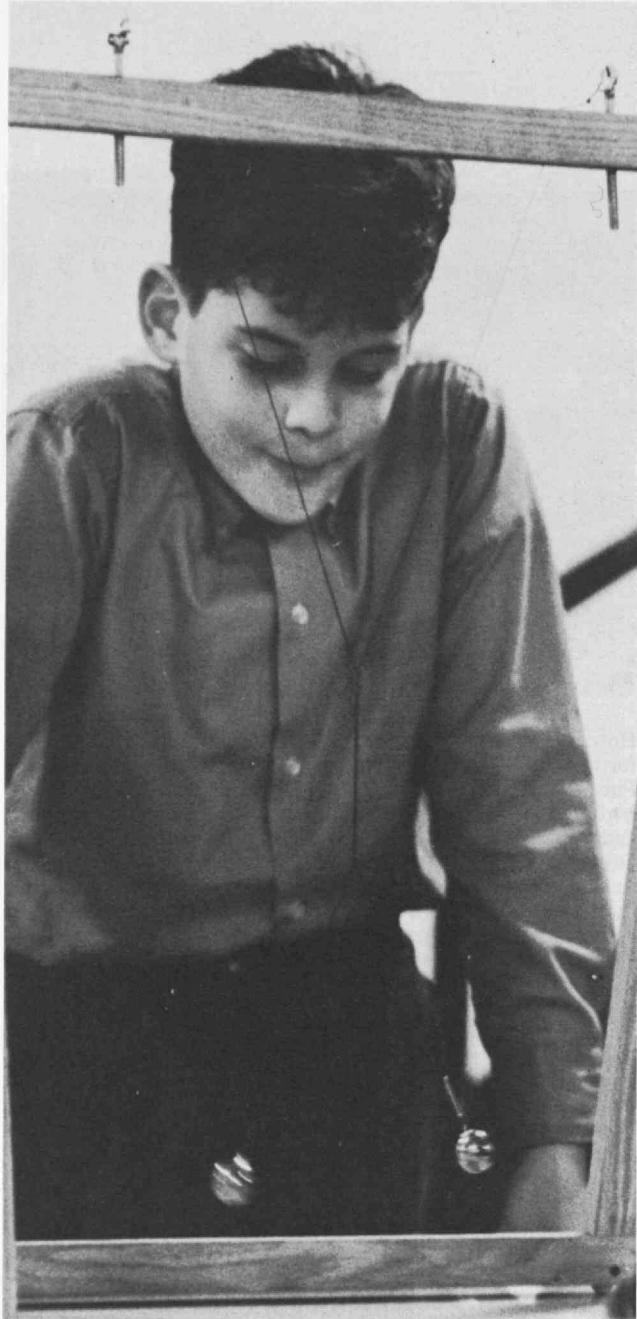
To repeat: don't expect this remarkable conclusion (which Galileo and Newton and Einstein all struggled with, and which contradicted ideas that prevailed before Galileo) to be understood or accepted very easily. It is interesting and important to see the role of such *non*understanding when it is finally brought into focus. The great men of science have loved these places where "understanding" fails. Most of us do not; we gloss over the failure and pretend it isn't there. To recognize the places where our usual ideas fail us is often a prelude to discovery, for all of us. Perhaps lasting and creative understanding will not come *without* such preludes.



How else can a pendulum swing besides straight back and forth? Can it make a circle? A triangle? An egg shape? Put a large piece of paper on the surface under the pendulum; let the pendulum down until it almost touches the desk top, and follow its motions with a pencil. Or set up a peg anywhere under the pendulum, and try to swing the pendulum so it misses the peg on its way out, but knocks it down on the way back. Or set several pegs so the pendulum will knock down some specified ones and miss the others.

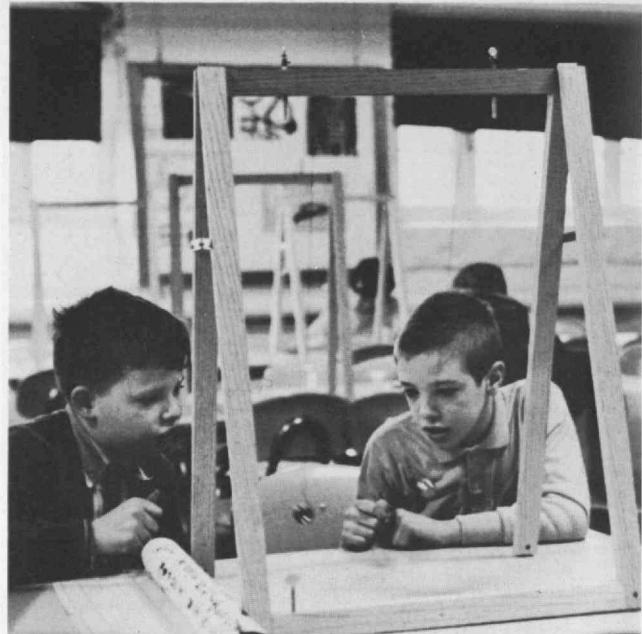
What about the time it takes a pendulum to make a circular trip? (Or an *almost* circular one; it takes some practice to get a good circle.) How does the time compare to a straight back-and-forth ("round") trip?

After "round-trip time" had become current, one teacher in a school class working with pendulums used "period" by a slip of the tongue, and two children picked it up, with no need for explanation. After all, the use of the word "period" to mean a stretch of time is familiar from "music period" or "lunch period."



There are certain kinds of similarity between the motions of pendulums and those of the big world of the solar system. Things repeat in a very regular way. One innocent teacher, puzzling over his experiences with pendulums, said, "What fascinates me about these things is the funny way they begin to make you think." We value this remark much more than the explanations out of a physics textbook, which can too easily be parroted without living through the "funny way of thinking" that Galileo and Newton discovered.

But there is one nice thing to do which immediately suggests things like planet orbits. Start two pendulums swinging on the frame so that the strings cross and twist up quite far. Watch the twisting and untwisting. Watch one ball at a time and see what it does. Try it with different weights on the two strings. It is even nicer with ceiling-length pendulums.



People sometimes want stop watches or sweep second hands to time pendulums' round trips.

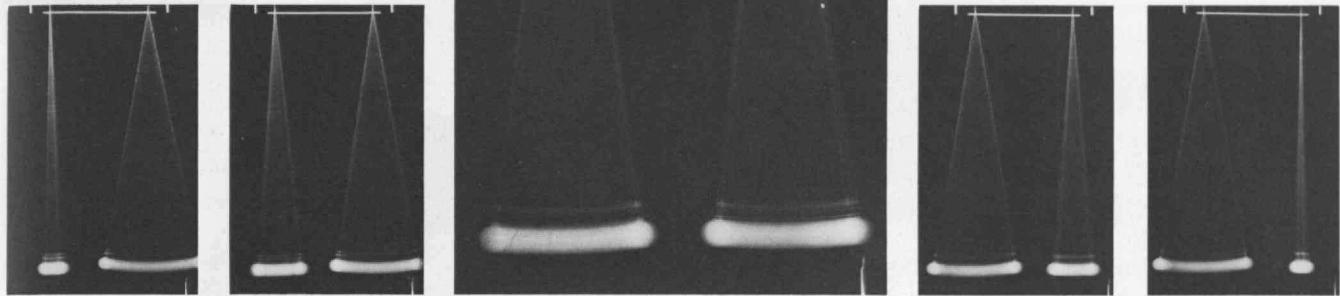
Galileo used his pulse. Try this nice pulse counter—a long, broom straw or soda straw pushed over a thumbtack. The tack sits on the pulse spot on the wrist. The straw jerks quite visibly with every beat. Perhaps the investigation of pulses will start a new line of inquiry.

With two pendulums you have a built-in counter, each keeping track of the other. Their round-trip times can be compared easily by two people. One counts an agreed number of swings of his pendulum silently, and says the last number, "10" or "40," out loud. The other person counts his pendulum swings silently, and when he hears the other's number, announces his number. "If one makes seven swings while the other makes five, how many will it make while the other makes 10?" Unlike the word problem in arithmetic, this one leads to experiments. The count was 14:10, and 28:20 was the next prediction; but the result was 27:20. With this to puzzle over ("maybe we missed a count; let's do it again") the students are in a position to see the *approximate* nature of these comparisons. "My pendulum hadn't quite gotten back all the way, when you said '10.'" Make a graph, using pegboard with golf tees or other pegs for markers. "5 up and 7 over; 10 up and 14 over; 15 up and 20 over; 20 up and 27 over." Ought the line connecting the pegs to be perfectly straight? If it is not, is this because the pendulums change or because our comparisons are not exact?

A curiosity: if two pendulums are an inch or two different in length, they get out of phase and after a while will be swinging opposite ("like legs walking," said a kindergartener); still later, they will come back to one's hands just together again. Stop them there.

Can you make one pendulum do 20 round trips while the other does 10?

This problem leads on to a good study in proportion: supposing you have the two at the right length, so that one does 20 while the other does 10; now lower the short one an inch. How much will you have to lower the other? "The same thing," most people will say. Try it. Not enough. "It should have been two inches." Try it. Not enough. By the time they realize that they must change the long string fourfold for every change in the short string, they will have done some deep thinking about proportionality.



A detailed analysis of the transfer of motion from one coupled pendulum to another is not easy, but children (and their teachers) can develop a grasp of some of the essential features of the process. It is this kind of understanding that is in the long run most important, even for professional physicists.

People quickly re-use a pattern in the back-and-forth transfer of motion between two coupled pendulums; the *stop to go to stop* cycle seems to repeat, time after time. If the slower one did 15 round trips, how many did the faster one do? This question stops a good many people for a while, children and innocents. Is there a round trip here? From swinging together to swinging opposite ("walking") and back to swinging together. One child hesitatingly called it a "marriage-divorce-marriage" round trip.

A good way to begin thinking about this round trip is to ask, and find the answer to, this question: Does it always take the same number of swings from *stop to go to stop*?

How does the transfer period (the stop-go-stop round-trip time) change when the height of the stick is changed? To begin with, try it in the symmetrical case, with two identical pendulums and the stick nicely horizontal.

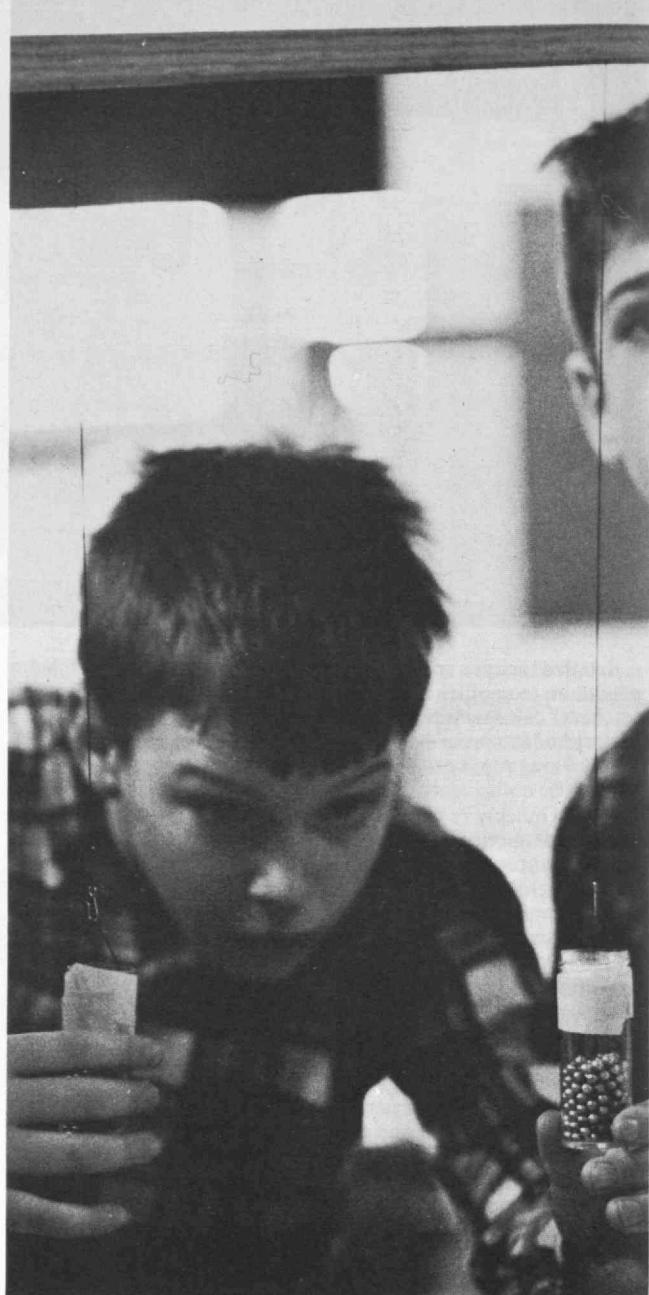
What happens if you release the weight so that it swings perpendicular to the coupling or in a circle? What differences do the lengths of the strings make, the height of the stick, the weight of the balls? What if the coupling is soft, a piece of masking tape instead of a stick?

What difference do these changes make to how the weights swing, you might ask. Do the weights still stop and go and stop? Both of them? It's hard to tell unless one ball is hanging straight down and quite motionless when the other is released, and even children will be ready to pay some attention to this by now. Also, the phenomenon is at its most elegant when the balls are started with care.

Here's one more thing to try. Hang two pendulums of the same length from something like a clothesline, and see what happens. Hang two the same length and a couple more of different lengths.



With a pair of coupled pendulums, can you make both balls swing without the stick moving? Can you make both balls swing exactly as they would if the stick was not there? In one instance, these questions led to something unexpected. In the process of varying the height of the stick, two little girls (who had not been much interested in "science") had put the stick way down, four or five inches from the balls. They had released both balls by pulling them apart equally in opposite directions and letting go at the same moment. "Ours isn't working right," they said. Their expectations had been unconsciously conditioned, so they called their nice discovery *wrong*. Try it for yourself. This particular "wrong result" was christened "the twist." Try "the twist" at various heights of the stick. Is there also a kind of round-trip time here? (The phenomenon was new to us, incidentally. We thought of the pendulum for one set of uses. Children have found many others: much of what we were not clever enough to foresee is as good as or better than what we first had in mind.)



In comparing pendulums with weights the same size and shape, everyone will know what it means to ask whether they are the same length. You can measure to the end of the string, the top of the weight, or the bottom of the weight. But if the weights are of different size or shape, what then? A three-inch piece of doweling with a hook replaces a ball. Will the round-trip time be the same? The other pendulum with the ball still on it can be used for getting the answer. How will you change the height of the dowel to make them swing the same? Perhaps someone lines up the bottoms of the ball and dowel.

Education and The Need to Know

True growth depends upon
a dynamic match between
an individual and his culture

By Edwin H. Land and Stewart W. Wilson, '60

Teaching and learning within the framework of the school system are being studied and mastered by the largest and most competent group of creative scientists, engineers, and humanists in the whole history of education.

But intellectual growth and enjoyment also occur outside of school hours and outside of the school years; and the university must take the lead in the exploration of this new domain, because a large part of the knowledge, discernment, and technology required for instituting this new activity outside of the university resides within the university.

Our view is that one of the most powerful techniques whereby humans learn is to ask a question, hear an answer, ask another question, hear another answer and so on. The quality of what is learned depends on whether the answer is a good answer, and on the manner, tone, and responsiveness with which the answer is given. As our society ages and becomes more complex, there are fewer and fewer people proportionately who can give good answers and who can answer patiently and responsively. So we have had to resort to schools in which groups are instructed and in which the alternating sequence of question, answer, question, answer must be prohibited.

This newer process, the school process, varies in efficiency from the deplorable to the superb, but it operates only within the dimensions of its own evolution and is necessarily remote from the question-answer mechanism which is intuitive for the human mind. Our own view is that there never can be a revolution away from any major accomplishment, for every major human accomplishment so shapes the human race that it is the human race. Schools, and the kind of learning that is carried on in schools, are from now on inevitable components of our very being.

But this does not alter the fact that one of the most primitive and natural human drives has had to be inhibited nearly totally in the course of development of our mass society from its technological infancy. Now,

happily, the time has come when it appears feasible to release that inhibition. The time has come when we can direct all the power of our technology to make it feasible for anybody to ask the questions he wants to ask of the distinguished person from whom he wants an answer, and immediately to follow the answer with still another question.

Our vision goes something like this. Imagine that, wherever you are, you are able to pick up a telephone and ask for, say (if it happens to interest and intrigue you at the moment), Edward M. Purcell's thoughts, insights, feelings about momentum, about what momentum is. And imagine that, having done this, Professor Purcell's voice comes back to you and starts speaking about momentum, with all the directness and freshness that only Purcell can give to Purcell's conception of momentum.

Now, you might have chosen a different voice, of equal interest and competence. But whichever voice you pick from the galaxy of voices at the other end of the line, you always get an authentic and competent one, you always get a *best* voice in the field you are interested in.

That is the first part of the vision: That the thoughts and insights, the way of seeing, of our very best men (the men, for example, who have contributed to the Physical Science Study Committee) will be instantly and directly available to every one of us; that their statements of what, through a lifetime, they have come to feel and the way, in their own voices, they express it, will be instantly on call.

The second part of the vision has to do with our part in the interaction, for we do have an interaction in mind. As we listen to Professor Purcell's statement we will not want to listen passively, for we will find out that just listening passively will permit us only the slightest appreciation and understanding of what he means, and means us to see; indeed, of the whole process of thinking about momentum that led up to the completed, accurate statement we are listening to. Really to appreciate and understand, we will have to be able to stop the voice, repeat the voice and ask it questions, and the voice will have to be able to respond to our questions and appreciate *them* in very much the same way that Purcell, in preparing the statement, throughout his whole lifetime, appreciated and responded to his own questions. For behind his statement about momentum lies a grand, complex, and sometimes bewildering process of understanding, a process of understanding that he had to live through, one which, if we are to get even a partial understanding of momentum from his statement, we will have to live through too, but in our own way.

So the voice must be divergeable, controllable. It must not rush on, however beautifully, when we don't understand; it must answer our questions. And it must also be prepared for questions, not only about specific confusions, but questions which shoot off from the main track because something Professor Purcell said,

"If an atom lost . . . yeah, I mean if
an atom lost its electron, . . . where
would the electron go?"



something whose richness he hinted at, makes us want to go there

Thus the second part of the vision says that not only are the best and most accurate statements, not the watered-down statements of the earlier traditional education, available at the other end of the line, but also that these statements can be searched through and explored in exactly the way our own minds require, according to our own internal imperatives, logical, illogical, brilliant, or otherwise.

Another and fully equivalent way of stating this vision is to ask: Why can't we make these life-generated and life-filled statements available to students in a way, through a link, that is more vital, more human, and more responsive than the printed page? And why can't we make these men's statements available through a link which mitigates the enormous task of finding and training people who can competently resay them? In short, why can't we make the link direct?

There are very pressing reasons of a social, demographic nature—the shortage of teachers, for example—to encourage this effort. But more important still, we should create this direct link because its existence will extend and amplify, by a quantum jump, every person's appreciation and understanding of the world.

Problems for Both Engineering and Science

To make the link a reality will mean solving some engineering problems of great but not insuperable magnitude. In fact, the engineering problems should be a joy to work at because the goal is so human. But there is another whole area of investigation, an area more properly scientific than engineering, that will have to be explored. For, when we place any student—including indeed ourselves—in an environment in which his intellectual reach is enormously extended and in which he has, for the first time, the chance to draw the culture to himself, we should not be surprised to observe whole new patterns of behavior on his part, whole new ways of relating to that culture.

In plain terms, what happens to you when you can ask and can get what you ask for? What happens when the answer to the urgent question which has *just* emerged from your unconscious is *immediately* available from the environment?

Matching Cultural and Student Circuits

We sometimes think of the link we have been talking about as a good impedance match: The cultural circuit delivers its power when the student circuit is most ready and willing to absorb it. And when the student circuit delivers *its* power, in the form of an urgent question, the cultural circuit is not absent, or deaf, or insisting on its own signals; the cultural circuit listens and responds maximally.

So the scientific question can be stated: What happens when the impedance match is good? What kinds of questions and sequence of questions does the student ask? What structures, through the impedance match, take root and unfold in his mind? And what is the pat-

tern of their unfolding? In a larger sense, what does the well-matched availability of the structures of the culture mean to the human mind? What kind of availability—precisely what kind—does the individual require in order that the cultural structures become a part of him?

This is a new intellectual realm and wants a new science for its investigation. This science today is almost nonexistent, but it has been begun; and this report describes some concrete experimental steps in which we* attempted to create the relationship which we have described.

For students we used a small group of 13- and 14-year-old boys from the Roxbury section of Boston. They were selected for us on the basis of our request for individuals who would be open and interested.

The boys came, usually one at a time, to an apartment in Cambridge in which there was a pleasant, comfortable room in which they would feel private and relaxed. Each boy came approximately once a week for as many as 10 weeks, and there was no compensation for participating other than bus fare.

The student room was equipped for the experiment with an audio and a visual channel. The boy listened by way of a small loudspeaker and voiced his questions into a microphone. The visual channel consisted of an analog device having a pen which could be made to write and draw sketches by remote control. Any graphical information which the boy received came to him on this device, the Electrowriter.

The boys were met when they arrived by a receptionist who told them they were to use an experimental machine, designed to allow them to explore a subject freely. She explained that the voices they would hear came from tape recordings, and that the machine was capable of receiving a question and switching to a tape containing an appropriate answer. The boys could stop the machine and ask a question at any point, and they had a small control panel which let them signal for repeats, skips, and so on.

The boys were told they could use the machine as long as they liked and in any way they liked. The receptionist was available in another room in case the "machine" failed to operate correctly.

The other end of the link was housed in a third, concealed room in the apartment. There we had tape playback equipment, an operator, and—according to our technical term—an expert. The boy's questions were heard by the operator and the expert, and between them they decided whether to answer "live" or by using a passage from a previously recorded set of tapes. The subject of these tapes was atomic physics, mostly descriptive and without the mathematics, though the conceptual content was fairly rich. The style of the atomic

*The project began some years ago when one of the co-authors (Land) had the essence of the dream and stated its basic questions to the other, who undertook to bring concreteness through a long series of studies and experiments.

physics tapes was relaxed and informal but without loss of rigor in any important sense.

Atomic physics was the subject of the majority of the sessions, and one of us (Wilson) who had made these tapes acted as expert, selecting from the recordings or giving live answers as needed. When it became evident that two of the boys had a strong interest in astronomy, the machine became capable of talking about astronomy through the expert knowledge of Professors Purcell and Carl Sagan of Harvard, who knew that field and volunteered to participate in this work and to whom we are very grateful.

The boy never saw what was in the expert room, the expert or the operator. And the operator and the expert never saw the boy. There were no one-way windows. The boy was told he would be speaking and listening to a machine, because we wanted him free of any feeling of being watched or judged. And we wanted him to be uninhibited about stopping and questioning the voice.

We felt that if the impedance match were really to exist between the boy and his culture, then the boy's interaction with the expert who represented and expressed that culture should avoid the special and perhaps irrelevant interaction of their peculiar or special personalities; we feel that the interaction between the boy and the culture should be human, but not personal.

Of course, we were also curious to see how the boy took to a machine which could understand and talk to him. What would his attitude be? And then we also had in mind the fact that any widespread implementation of this arrangement is not going to be person-to-person—at least not very often. The boys may have suspected that there was someone in another room, but they never asked about it.

So the boys came and were told that the day's subject would be atomic physics or astronomy. They started the machine by asking a question or by just asking it to start where it left off—and then they and the expert began to explore.

Let us restate our motivation in doing these experiments and then go on to the results. Our first hypothesis, very simple but fundamental at this point, was that these students would react positively to the machine and would value the opportunity to use it. Our second hypothesis was that beyond just liking the machine they would interact with it in a serious, confident, and earnest way. Our third hypothesis was that if the impedance match was good, the questions the students asked—remember that these were not specially selected, brilliant students—would be interesting and exciting, the kind that make teachers happy and joyous.

The evidence suggests that our first hypothesis is correct, that these students valued—indeed prized—the opportunity to use the machine.

Hard Listening to Hard Subjects

The sessions lasted an average of two hours each, with

a range from one hour to as much as three. During this time the machine was in continuous operation, with the student either listening or asking a question. All our ordinary ideas about a 13-year-old's span of attention in listening to hard subjects are shaken by this result.

Not only did the students spend a long time in the room, but they concentrated. Their absorption in what they heard is shown by the fact that their questions were, most of the time, either related to or clearly suggested by what they had just heard. And most of them took notes, in one case overflowing notes, straight through the session. (We might mention also that getting to the apartment and back to Roxbury was a one-hour bus ride each way, and that the students came after a full day in school.)

And, finally, they *told* the receptionist how very much they liked it!

Demands and Disappointments

Our second hypothesis—that they would use the machine confidently and with a sense of the importance to themselves, of entering into the interaction—was quite dramatically confirmed. Questions were exacting, even demanding at times, and there was often considerable disappointment if the machine could not answer. (This sometimes happened, and the fact was signaled to the student by a light on his panel.) Here are some examples of the questions, showing how earnestly the 13- and 14-year-old boys questioned the machine.

Q. *Now! Could you explain to me the first dimension, the second dimension, the third dimension, the fourth dimension, and the fifth dimension, and the sixth dimension—all in detail; and, if you could write it on your Electrowriter, please do. Thank you.*

Q. *Explain to me please . . . and don't say "no answer available" . . . explain to me the theory—Einstein's theory—of relativity, sumpin' like that, you know, relativity.*

Q. *Could you tell me what is beyond Pluto, or what do scientists theorize is beyond Pluto, or if they have any hard knowledge . . . fact . . . of what is beyond Pluto?*

Q. *What does "geophysics" really mean?*

Q. *Could you tell me all about astronomy? And show me on the Electrowriter too please. All about the stars, every star in the universe, all over the universe, every star in any other universe. Just mainly stars and planets and show me on the Electrowriter please. Thank you.*

Exciting Intellectual Moments

Our third hypothesis, if you recall, was that if the impedance match is indeed good, exciting intellectual moments will occur. Here is an example.

Q. *Why doesn't the match light in the carbon dioxide? You said before that oxygen helped to make . . . helped to . . . that (cancel) Why doesn't the ox . . . why doesn't the match light in the carbon dioxide? When you stick a match in it. And tell me why you said before that the match lit when . . . that a match, that fire needs oxygen in order to burn?*

(Notice how his hesitations, corrections, and fresh leaps

forward express and reveal the deeper structures underlying his question. The tone and timing—the whole *process*—of such questions is hard to convey on a printed page.)

This boy had heard about the smoldering match flaring up in oxygen, quite a way back in the tape he was listening to. The tape had gone on, and at one point the fact that a match does not burn in carbon dioxide was mentioned. The tape then went on *even further* to something not related to this matter. But then suddenly, later, the question came: its gestation was over, and it was born. We think this is a very exciting example (and there are others like it) because it shows, first, how fresh and acute a boy's questions can be (How many of us would think of it this way? And yet, if you changed the substances involved, he would be exactly right—oxidation does not require free oxygen); secondly, it shows how he has been listening and trying to integrate, which means make sense out of, what he hears; and finally, it suggests something about the *technique* of making the impedance match effective.

We cannot tell at this early point whether the train of thought which preceded the overt asking of this question was conscious or developed mainly on the fringes of consciousness. This is a matter we would like to explore. But it is clear, at whatever level the thought-line developed, that it was a *long* thought-line. Indeed, we find that the most exciting questions have the longest thought-lines. And this suggests, as a general principle, that a good impedance match is one in which the development of thought-lines—they are probably very delicate—is not perturbed. We shall return to this a bit later.

Now here is an example of a boy wrestling with an idea, an idea he almost grasps.

Q. *How could feathers be more dense than a pound of iron; a pound of iron and a pound of feathers, which weighs the most? How can they both weigh the same? It seems to me that a pound of iron would weigh, weigh more . . . but . . . feel heavier.*

This example shows how science has redefined words—iron *is* heavier than feathers—and how the concept of density is something that evolved very, very slowly. Here you can see it evolving in the child and you can be sympathetic with the idea that perhaps there is no kind of intellectual evolution, just as there is no kind of biological evolution, without going through the embryonic sequences; and so the embryonic sequences of ideas become something we must keep in mind.

The next question is an example of the formation of a hypothesis. Here is a boy who had just heard about gases and the fact that they are a swarm of moving molecules. The taped discussion then passed on to solids, and the fact that they, too, contain particles. The example used was diamond. He then asked this:

Q. *Do diamond crystals have molecules, moving molecules?*

We believe—we guess—that he said to himself, "A diamond crystal is so *different* from a gas. Yet he (the machine) says they both are made of particles. Maybe



the difference is that in a gas the particles are moving and in diamond they are not." We could be wrong about what he was thinking, but we think the lesson is that we must teach ourselves to listen.

Here is a question that is so beautiful that it eludes simple explanation. It is as though the atomic, particle nature of the universe is just starting to dawn on the boy. He is just beginning to feel it:

Q. *If an atom lost . . . Yeah, I mean if an atom lost its electrons, or lost an electron, where would the electron go? Or a neutron, or even a proton, if it lost any of its particles, where would they go?*

And here is the question that signaled a very important moment: his inner-felt urge to dive deeper into the atom. He had heard enough about the electrons around the outside and what they did. Now he was ready for the plunge:

Q. *Now! Show me a diagram on your Electrowriter of the electron system.*

Plunge it was, for he spent the rest of that session insisting, by pushing the "continue" button, that the answer (which was live) keep going.

Here are some questions by a mind which explores by comparing:

Q. *Is there any difference between the atoms in water and the atoms in earth, or dirt?*

Q. *How large is a sulphur molecule, and how large is an iron molecule? Show me the difference on the Electrowriter.*

Q. *Can you show me on the Electrowriter how a molecular bond breaks, and how an ionic bond breaks?*

Here is the same mind, and another, asking "why."

Q. *Why do oxygen atoms travel . . . (cancel). Why are oxygen atoms found in pairs?*

Q. *Why is it that when an astronaut goes out into space, and he's connected by a long umbilical line, a nylon line, why does he have a tendency to rise? Why?*

Now we have a sequence of questions by a boy for whom visualizations are very important to thinking.

Q. *Could extreme heat split an atom, and how would*

"How could feathers be more denser
than a pound of iron; a pound of iron
and a pound of feathers, which weigh most?"



it look if it could be split by extreme heat?

Q. If I could split an atom at home, how would I go about doing it? Show me an example of how.

Q. How would the inside of an atom look after it has been split? Please show an example of how it would look.

Q. Could you show how a proton would look if it is split in half and what are the particles inside of it?

And, finally, we see how this boy's visualization leads him to a conceptual paradox. He had heard how the positions of the electrons, since they are on the outside, define, roughly, the size of an atom. Then he asked:

Q. You said the size of a molecule or an atom depends on where the electron is. What happens if the electron is one-millionth of a centimeter in large, and is over in the right-hand corner or over on the edge of the atom?

We hope you will understand sympathetically that these are our very first experiments, our first probings of how a boy would explore and, in his own way, relive the structures of his culture, and our first attempts to make a part of that culture available in a way that means something to his mind.

The experiments were imperfect in several ways. We were not able to have the boys come oftener than once a week, and in many instances we could not follow every path their minds wished to take (we had to say "No answer available" or "No more answer available").

But we *did* the experiments. We learned from them, and we felt the color, life, and—we think—great adventure of this new science.

Unfolding the Structure in the Mind

But here is what we learned. We learned that the willingness of a student to reach out from the structure unfolding in his mind, to keep on unfolding it, is highly dependent on the attitude, the willingness, the very *tone* of the teacher at the other end of the line.

If, for instance, an answer by the teacher is too nearly perfect, too textbook-like—that is, if the teacher is more an information transducer than an originator—then the possibility that the next question will follow along the same track is low. And this seems to hold even when the teacher is very clear. On the other hand, if the teacher's answer is relaxed, exploratory, and does not imply a desire to impose a pattern, if the teacher uses his mind the same way he expects the student to use his, then the chances of a next question are high.

We find, in addition, that the more a teacher expresses his own feeling for the subject, his own unique point of view, without implying that he expects the student to adopt it, the more successful he will be in eliciting a subsequent question.

(One of the great values of our experimental arrangement was that it let us see these things more clearly, perhaps, than ever before. Because of their interpersonal separation, and because of the student's control, the student and teacher were, temporarily, peers.)

When we come to larger patterns of ideas, like whole subjects, we find that a teacher's habitual desire to direct

the discussion in preconceived channels is inevitably frustrated, frustrated because the student *demands* changes of course, or, in the case of students more easily led, because the student's questions become less interesting or die out altogether.

It has become clear to us, in these experiments, that students want to structure knowledge in their own unique way. They want to follow an idea for awhile, until they are surfeited, so to speak, and then pick up another idea. (They return to the first idea perhaps the next day.) They do not honor the logic with which centuries of work has structured a subject, because they do not feel that peculiar and singular logic in themselves.

But it would be an error, we think, to suppose that what the students *are* constructing, as they leap from question to question, is not solid or ultimately fruitful. Isn't it clear that a path put together of things you really want to know, connected at *exactly* the moments you want to know them, will be more meaningful, more vital, and ultimately more fruitful than a path obtained from someone else?

This does not mean, though, that the teacher should be completely passive, should just wait for a question, answer it, and then wait for another. We have tried that and it does not work; although the questions come, they are old, stored-up questions. They are not likely to be intimately related to what the teacher has been saying. We think the trouble is that in *merely answering* a question, and then stopping, the teacher fails to evoke very many new "thought-lines" in the student's mind and brings those that *are* there to an end. What the student wants, and shows by signaling, is that the answer continue, blossom, and make contact with other things. Then the thought-lines continue and blossom, too, and an interesting question comes.

A Revealing and Expressive Guide

The student wants the teacher to guide him, but he wants his guide to be someone who *reveals* and *expresses*, without ever attempting, either actively or through inaction, to control.

Guides like this are hard to find. The role requires broad competence and the ability to adjust quickly to a student's frame of reference, and it also requires an untiring willingness to do so.

Being a good guide, being this new kind of teacher, means relinquishing the traditional concept of interaction between student and teacher. The interaction is there, but it is between the student and, in a broad sense, the culture around him. The guide is there because he may see more, or see further, or see in a special way. But he is not there to impress a set of ideas on the student, or even to facilitate and individualize a student's adaptation to a given set of ideas.

The guide is there because he is the vital intermediary, the impedance matcher, between the structures unfolding in the student's mind, whatever they may be, and the structures of the culture. This is often a very self-effacing task, but it can also be an exceedingly exhilarating one.

We intend to go on with this study, with this new science of the free and inner-directed interaction between a student and his culture. We intend to understand clearly and deeply just what goes on in a student's mind when he reaches out, and what must be there to reach out *for* if the unique, highly personal, and, therefore, highly authentic, structures developing in his mind are to thrive.

We feel that the study of how a boy does this, how we can help him *do it his own way*, is the next domain that must be mastered. Now that the techniques for working within the schools with large and organized groups has been brought so far by the Physical Science Study Committee and Educational Services, Incorporated, all of that work, in addition to being invaluable in the new classroom program, has provided a set of clear, felt statements of the way our best minds see nature. Making these statements available in the new system is our next full step. But we must then learn what availability *means to the human mind*.

Here is how we are going to do it. We are going to go on with experiments of the kind described, to find out exactly what makes for a good, lasting impedance match; and we are also going to begin developing the technological tools which will make our vision practical.

We have built a rather unique educational laboratory. In it we have private rooms for students and studios where teachers can make recordings and from which they can answer students' questions "live." We have a system which allows us to record, on the second track of a stereo tape, the diagrams which accompany a teacher's voice. When the tape is played back you hear his voice from one track and watch the recorded diagrams evolve from the second.

We are experimenting with indexing systems which will allow a nonexpert, but reasonably literate, operator to find answers to questions in previously recorded tapes. We are well aware of the vast and difficult problems of rapid and effective information retrieval, and we hope to draw fully on the results available internationally in this area. But we feel we should not stop and wait for the advent of completely automatic retrieval systems, because we feel that something short of full automation may be practical, that human operators, assisting computers, can serve the purpose of translating the voice to the machine during the next five, ten, or twenty years.

Human operators may be an important research tool in developing a more automatic system because we can observe the operators as they use indexes to retrieve tapes, and we can pick out gradually those parts of their activity which become regular, routinized, and strictly definable. And then, knowing what those activities are, we can define them to a machine.

The retrieval problem, attacked in this way, will form an important area of our research in the new laboratory, but there is a second technological area in which we are going to depend wholly on the work of others. I mean the problem of automatically recognizing the spoken word. Estimates of when this will become possi-

ble range from five to 20 years. But we believe it very important that a student be able to *speak* his questions; in fact, for younger students whose skills in written expression are undeveloped, that is the only satisfactory way. We will, therefore, continue to allow students to speak their questions directly; and, pending development of an automatic technique, we will continue to rely on operators for speech recognition. As a matter of fact, human operators may ultimately be as fast and as practical as an automatic device, since you have to wait for the words to be spoken, anyhow.

Thus we have begun to do two kinds of research in our laboratory—research on the way a student draws the culture's structures to himself, and research on how we can make the drawing, the interaction, the impedance match possible and practical for all students. Our work has convinced us that people enjoy and can grow through the question-answer-question approach to learning. We have satisfied ourselves that this may indeed be the best route from the naive and primitive, to the expert and sophisticated, mind. We have discovered that when people are sincerely permitted to learn in this way, they expect and demand a great deal from us. The initial answers must be given by men of enormous competence and considerable humanity, and we know that such men can be called upon only a few times for such a painstaking contribution. Americans go from mighty dreams to powerful realities through the intermediary of technology. Yet we often distrust, or lack confidence in, technology's relevance to man's deepest intellectual needs. We hope that this curious humanistic distrust will not block the evolution into reality of this particular, highly humanistic, dream.



Edwin H. Land's most recent honor has been the 1966 Albert A. Michelson Award; he holds seven honorary degrees and is a member of both the National Academy of Sciences and the National Academy of Engineering. Dr. Land founded Polaroid Corporation in 1937, and he is now its president and director of research. As Visiting Institute Professor at M.I.T., he has had an important role in stimulating development of the "project laboratory" programs.



Stewart W. Wilson, '60, who is working with Dr. Land on this unique educational experiment, is a graduate student in the M.I.T. Department of Electrical Engineering. His thesis will be an experimental study of the question-and-answer process, and he is also interested in pattern perception and the ability to interpret words.

The Trend of Affairs

Aerospacemen Descend on Boston

Aerospace engineers and scientists took a long, hard look beyond their frontiers at the American Institute of Aeronautics and Astronautics third annual meeting and technical display in Boston at the beginning of December. Described as "somewhat revolutionary in scope" by the AIAA Executive Secretary, the meeting aimed to show aerospace professionals the national needs, present and future, to which they could contribute solutions. As a result the papers covered a wide range of interests, taking in subjects as diverse as planetary atmospheres, city planning, electric cars, artificial hearts, and earthquake studies, in addition to the more mundane problems (for AIAA members) of supersonic transport and orbital flight in the 1970's.

Apart from four specialist sessions, the meeting had five major themes:

Space-Science Experiments—The success of the Gemini flights suggests that complex manned experiments in space are now feasible, and this fact provided one of the main take-off points. The session on "Manned vs Unmanned Science in Space" highlighted Apollo x-ray experiments and lunar surface exploration as examples of activities which depend on the presence of astronauts. Among other aspects of the general theme were the uses of satellites and manned spacecraft for meteorological experiments, proposals for space-based radio telescopes and general reviews of solar astronomy, x-ray astronomy and optical astronomy.

Air Transportation—On a general level these sessions looked at the coming changes and new problems inherent in the development of jumbo airliners, supersonic transports, and short and vertical take-off and landing aircraft. The introduction of jumbo airliners received qualified approval from H. F. Klumpp of Lufthansa Airlines, while later papers dealt with some of the approaches necessary to cope with them—such as computerized baggage checks, elevated aircraft parking, and new safety considerations.

In a more specific series of sessions, authors looked at the Boston-to-Washington corridor, with particular reference to the interactions between the available forms of transport in the area.

Manned Orbital Flight in the 1970's—This preview of the contribution space flight will make to our life in the next decade envisioned manned space stations, the first manned expeditions toward Mars and Venus, lunar bases, and great scope for astronomical advances based on manned space vehicles. Advanced engineering topics (for the 1960's) such as re-usable launch vehicles, space rescue, and the design of space stations also came to the collective attention of the experts.

Propulsion Systems—There was general agreement that currently available propulsion systems would suffice for the 1970's; however, by the early 1980's, large electrical propulsion systems using nuclear power may well offer the way to long interplanetary flights, even though lift-off will remain in the realm of chemical propellants.

Aerospace Technology Utilization—This was the theme that really allowed the AIAA members to forget their professional identities and hear and talk about how much

their industry is contributing to the advancement of man. Under five topic headings—information processing, training and simulation devices, the systems approach, medical applications, and energy conversion—the extent of spin-off from aerospace emerged. And papers on the systems challenge of football and the systems approach applied to planning in the Catholic Church showed just how far the aerospace influence can reach.

Five M.I.T. Faculty members gave papers at the meeting: Secor D. Browne, Associate Professor of Flight Transportation, on "National Transportation and the Role of Long-Haul Air Transportation"; Edward B. Roberts, '57, Associate Professor of Management, on "Systems Simulation of Industrial and Economic Problems"; Alexander J. Bone, '24, Associate Professor of Civil Engineering, on "Historic Review of Transportation in the North-East Corridor"; Robert W. Simpson, '64, Assistant Professor of Aeronautics and Astronautics, on "Operating Dependability in Air Transport"; and William W. Seifert, '47, Assistant Dean of Engineering, on "Technology of High-Speed Ground Transportation."

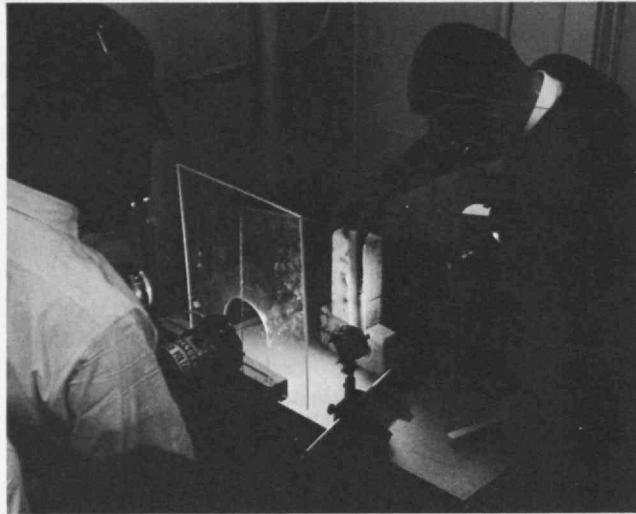
Sophomores Add to Laser's Uses

"An educational breakthrough, in which sophomores are encouraged to act as graduate engineers." This was the comment of Robert B. Williamson, Assistant Professor in M.I.T.'s Civil Engineering Department, on the Department's new laboratory course. He made it at an M.I.T. press conference announcing the course's first spectacular success—practical rock crumbling by laser. This method apparently has great potential for boring tunnels through hard rock, which is a problem of broad engineering interest now attracting attention for future transportation systems.

The object of the laboratory course, started this term, is to give sophomores an opportunity to tackle problems unfettered by the textbook restrictions of normal undergraduate projects. This term's project was to investigate possible methods of boring through the rock 500 feet below ground in the Boston-Washington megalopolis to produce a tunnel for high-speed transport through the Northeast. Robert A. Gladstone, '69, and Anthony C. Kettaneh, '69, after rejecting proposals such as flame, chemical, cryogenic, and magnetic means, decided to test the possibility of lasers, a decision which arose in part because Robert—son of Richard E. Gladstone, '40—has long been a laser enthusiast.

M.I.T. professors were dubious about the project, believing that the laser beam either would produce too little power to affect the rock at all or would merely melt a small area of rock. In view of these doubts the students decided to use an extremely powerful laser; after three weeks they came across David R. Whitehouse, '54, of Raytheon Research Laboratory, who allowed them to use Raytheon's one-kilowatt experimental continuous gas laser, which had been built only four months previously. This carbon dioxide laser emits a continuous beam of radiation at a wavelength of 10.6 microns, and is one of the most powerful known at present.

In their first, unsuccessful experiment the students focused the laser onto a sample of rock, giving a beam about one eighth of an inch in diameter. Then they decided to try again with an unfocused beam; this covered an area about one and a half inches in diameter, and after five seconds small cracks appeared in the sample of rock.



Rock crumpling by laser. One kilowatt gas laser (above) lases a rectangular sample of rock. At right, sophomore students Anthony Kettaneh, '69 (left), and Robert A. Gladstone, '69, examine a piece of Manhattan schist they have lased. Their successful development of a method of crumpling hard rock by laser may eventually cause a heavy demand for lasers among tunnel borers.



The Trend of Affairs

After half a minute's lasing the rectangular samples (1" x 1" x 12") could be broken by hand.

Graduate student Pat Rad then joined Gladstone and Kettaneh in a program measuring the effects of the laser on larger samples of rock, using mainly granite and marble. Although in the early stages, these investigations appear to show that the effect of the laser penetrates three or four inches into the rock from its surface.

According to Professor Williamson, the Civil Engineering Department "seriously considers the method as a very attractive way to weaken rock." In practice, the laser will most probably be used to probe and soften up the weak points in the rock; conventional tunneling machines—which are unable to deal with normal hard rock—will then bore through these weakened portions. From the commercial angle, the U.S. Department of Commerce, which has a contract with M.I.T. for studies in advanced concepts of intercity transportation, has already expressed great interest in this new technique.

Twixt Air and Sea

In spite of the fact that 70 per cent of the earth's surface is covered by water, meteorologists know very little about the influence of the oceans on the air above, and hence on the weather. Conversely, the region of interest to oceanographers at present ends sharply at the surface of the ocean: data on the effects of winds, waves, and water vapor in the air above upon the sea below are virtually nonexistent. Next summer, Erik Mollö-Christensen, Professor of Meteorology at M.I.T., intends to start filling this gap between two increasingly important scientific disciplines in a new research program.

The project will be run from an oceanographic field station based on Buzzards Bay Light, a tower a few

miles southwest of Cuttyhunk Island, off the southern coast of Massachusetts. Professor Mollö-Christensen plans initially to take enough simultaneous measurements of air and sea in the area to keep tabs on the mean conditions; on the basis of these results he will design experiments to give a general picture of the air-sea interaction and to study various theoretical models for the generation of waves, under well-understood conditions.

The Buzzards Bay Light was chosen as the site of operations because it shows a remarkably steady wind pattern throughout the summer. Each day a fresh breeze in the early morning dies down by about 9:00 A.M. Then a southwesterly wind begins to build up gradually until it reaches a peak at about 4:00 P.M. The site has the further advantage that the nearest obstruction to the wind is Block Island, a comfortable 26 miles away.

The first task in planning the venture was to eliminate the effects of the light tower—a strengthened form of Texas tower—on the delicate measurements of temperatures, velocities, and stresses in the air and sea and the forces between the two media. For this purpose a model of the tower was subjected to a series of wind-tunnel tests. These showed conclusively that the tower exerted too much influence on the wind field for the experiments to be simply attached to it by a conventional boom. Professor Mollö-Christensen therefore decided on an entirely different approach—a buoy anchored at between 500 and 1,000 feet from the tower.

The buoy, designed by Eric Kraus of the Woods Hole Oceanographic Institution, will be anchored in 70 feet of water by four links of destroyer chain and four guy ropes. The business end will be a thin mast, rising from 20 feet below the ocean surface to 30 feet above, and the instruments—in, on, and above the water—will be attached to it by conventional sail hoist fittings. Cables will connect the instruments to a control room back at the light tower, where their readings will be recorded on magnetic tape for processing.

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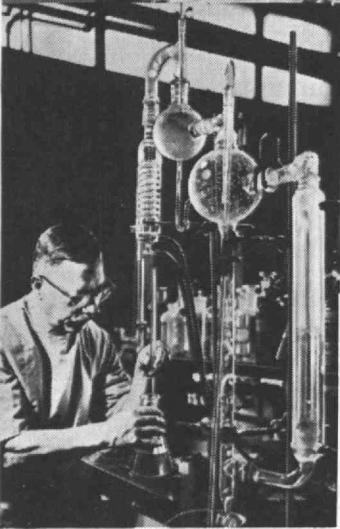
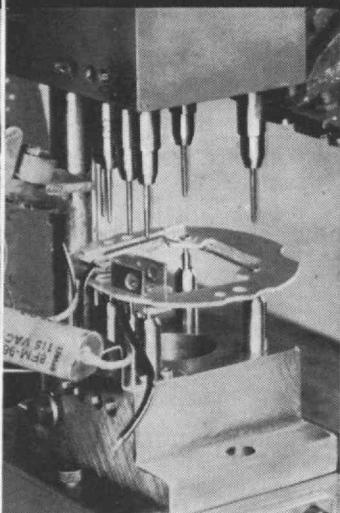
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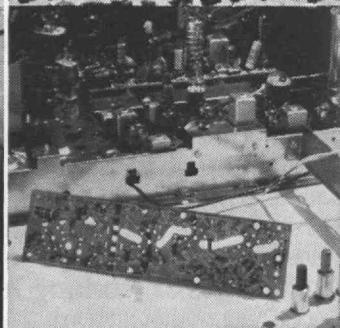


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The light tower itself will be the center of operations, and M.I.T. oceanographers will have at their disposal all the home comforts enjoyed by the resident Coast Guards, including a pool table and four bunks in the guest room for overnight stays. Normally, however, they will commute from Cuttyhunk Island, either by boat (a trip which has a hair-raising ending, as the visitors must be hauled up the 70 feet from the boat to the tower's lower platform) or by helicopter (which also has its share of excitement when the 'copter is coming down to the tower's small landing stage). The group is already taking preliminary measurements from the tower, which is something of a local landmark, its piercing light being clearly visible from Westport, Mass., 10 miles away.

As contracting work for the buoy gets under way, the main tasks are to design suitable experiments to take full advantage of the peculiar wind conditions prevalent in the area, and to produce appropriate instruments. Professor Mollö-Christensen feels strongly that his group should cater for every aspect of the experiments, right through to processing the data. "Not enough of this designing has been done before," he says. "We want to do more than take a large number of readings and then wonder what to do with them." Notable among the interesting pieces of instrumentation now moving from the drawing board to the construction stage are propellers of epoxy resin and of Fiberglas, designed to sit just above the surface and record the velocities of both the air passing them and the waves that lap over them.

Professor Mollö-Christensen hopes that the mast will be in place for its first trials—"shaking down" as he calls it—in the middle of next May, and that the instruments will be on board by June. After that, as soon as the teething troubles are overcome, the facility will start to fill in the gaps between meteorology and oceanography.

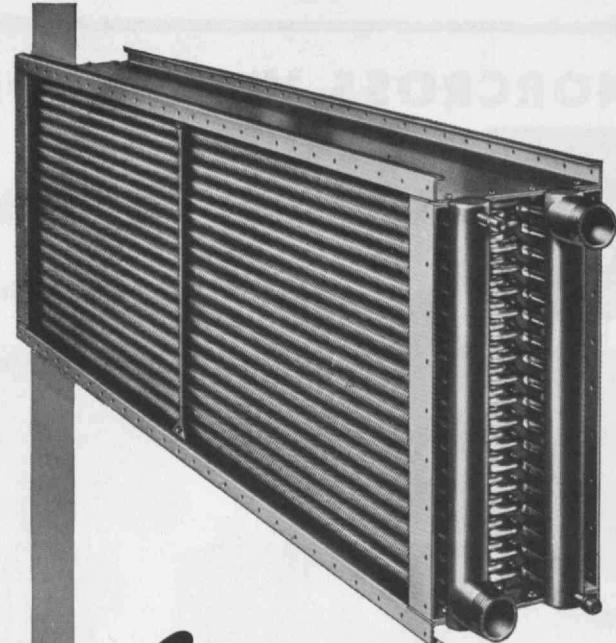
A Qualitative Measure of Society

How can we measure the *quality* of our social system? *Social Indicators*, a new book from The M.I.T. Press (\$10) this fall, is the first systematic effort at an answer.

Its editor, Raymond A. Bauer of Harvard University, and his collaborators suggest that some new "social" indicators must supplement the many "economic" indicators now in use. Their point is that decisions of government must be based on an accurate evaluation of what point society has reached, where it is headed, and how fast; and that this is possible only if we have "social" indicators which encompass human hopes and values as well as "economic" indicators of material and monetary factors. And, they say, even some of our present data are inadequate or misleading or both.

For example, on the "Cost of Living Index," *Social Indicators* author Bertram M. Gross, Professor of Administration at Syracuse University, says that "highly quantitative economic data . . . have promoted a 'new Philistinism'—an approach to life based on the principle of using monetary units as the common denominator of all that is important in human life."

Automobile accident statistics, Professor Bauer writes, are another example of misleading current data: "The average citizen, listening to and reading about the



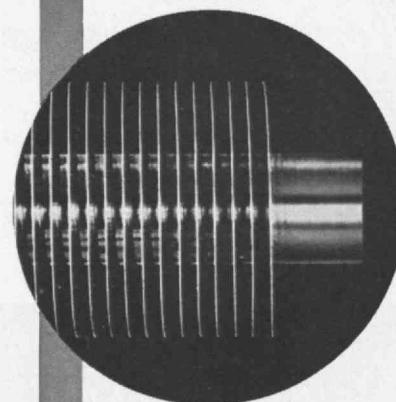
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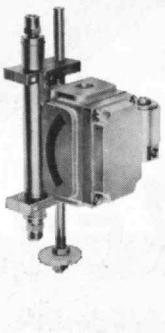
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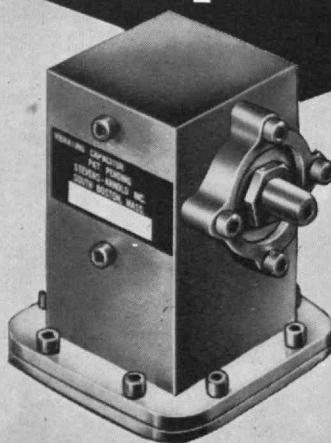


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The Trend of Affairs

cataclysmic holiday weekends, would conclude that driving has become increasingly dangerous, especially on holidays. The figures invariably cited are uncorrected for volume of traffic. (By this criterion holiday weekends are probably somewhat safer than ordinary days.) Over-all figures on annual fatalities are usually uncorrected for increase in population. (By this criterion the rate has remained about constant.) They are also uncorrected for automobile miles traveled. (By this criterion, fatalities are less than one third of what they were about three decades ago.) In short, traffic safety has improved remarkably."

Russian Action and Reaction

1965-1966 was the last year of what one might call the Khrushchev Phase of Soviet educational history—an extremely consequential experiment in the Soviet schools. The plan was started in 1958 by Mr. Khrushchev, author of the reform intended to bring education at all levels "closer to life"—meaning, basically, the introduction of universal vocational and labor training as part of secondary education and a requirement of two years of work experience after graduation from high school before application for admission to higher education in most fields of training. Practically all aspects of the educational process were affected by the precipitously introduced changes beginning with the 1959-1960 school year.

One example will suffice to illustrate the scope and implication of what was done in 1959 and of what is taking place now in consequence of the recent decisions to rescind most of the basic provisions of the 1958 school law. Under the provision for compulsory vocational training of every high school student, beginning with 1959, the term of secondary schooling was increased from the former 10 years (age 7-17) to 11 years.

Five years later, in 1964, the leadership decided to revert back to the old 10-year term, giving the school system two years for the readjustment. In consequence of this reversal, the Soviet Union in 1966 had two classes graduating from high school: the last contingent of the 11th-graders and the first of the re-established 10th grade seniors—a total of approximately 2.7 million graduates (as against 1.3 million last year).

Considering the fact that even the substantially increased quota for admission to full-time higher education in the fall of 1966 was set at only 404,000 (34,000 more than last year), the magnitude of the problem, if only of employment, can readily be appreciated. The result appears to have been some minor increases in technical and vocational enrollment, in response to heavy pressure, and a good deal of unprofitable maneuvering for place and jobs by the 1966 graduates.—*Alexander G. Korol.*

How to Rescue an Astronaut

Aeronautics students at M.I.T. have drawn up detailed plans for a sort of "orbital coast guard."

They call it NERO, for Near Earth Rescue Operation. It would consist of a fleet of boat-shaped spacecraft standing ready on launching pads to blast off within three

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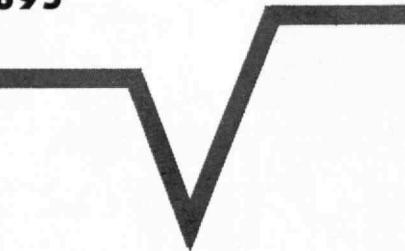


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hours of a distress signal to save astronauts stranded in earth orbit. As explained by the students, the manned vehicles could also be launched on missions to repair crippled scientific satellites, resupply manned orbiting laboratories, inspect suspicious foreign spacecraft and even clean up orbiting debris.

The plan, moreover, could be implemented with current technology and be in operation by the early 1970's, according to the designers.

The rocket would be an Air Force Titan 3-C, which has been flown six times and will be used for the Air Force Manned Orbiting Laboratory, scheduled to be launched in 1969. The spacecraft, though it would have to be modified considerably, would be based on the experimental M2-F2 gliding re-entry craft built for the National Aeronautics and Space Administration.

NERO was devised as a class project by 60 senior and graduate students at M.I.T. A 400-page report, complete with engineering design drawings, has been submitted to NASA for consideration.

A spokesman for the space agency in Washington said the report had been received and would be studied. The M.I.T. Press will publish it early next year.

Each year M.I.T. students spend a semester on such a study to get a taste of the team approach to large-scale space and technology planning. In previous years, M.I.T. students have conceived futuristic schemes for urban rapid transit systems, high-speed trains, and a manned mission to Mars.

Ever since Gemini 8's brush with disaster last March, when a misfiring maneuvering rocket forced the astronauts to make an emergency splashdown, NASA has shown an interest in developing a rescue capability. The aerospace industry was asked to submit proposals.

Eugene B. Konecci, a member of the National Aeronautics and Space Council, said in Boston at the annual meeting of the American Institute of Aeronautics and Astronautics that a rescue system was "necessary."

"We intuitively know that we and/or the Soviets will suffer a manned space catastrophe," he stated.

According to Yao T. Li, '38, M.I.T. Professor of Aeronautics and Astronautics who supervised the student project, a NERO spacecraft could be mounted on the Titan rocket, checked out and held on a standby basis any time a manned vehicle was in orbit. It could remain fueled and ready for up to 30 days.

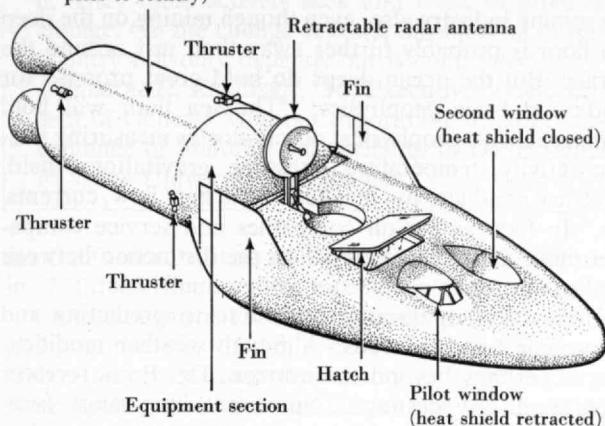
A single launching, the students estimated, would cost \$20 million. The entire program might run to \$2 billion for development and equipment costs for a fleet of 25 spacecraft.

NERO would be designed to be flown by a crew of two and to bring back two stranded astronauts at a time.

The spacecraft, weighing 13,000 pounds at launching, would be equipped with radar for rendezvous and a hatch out of which an astronaut could climb to inspect another vehicle and through which rescued astronauts could enter.

While in orbit, the vehicle would still be connected to the final stage of the Titan rocket, which could be fired to shift orbits or to climb to higher altitudes. The rocket stage, along with an equipment section, would

Final stage of Titan 3-C rocket
(used for power in flight; jettisoned
prior to reentry)



THE NEW YORK TIMES

Astronaut 'Lifeboat': space rescue craft designed by M.I.T. students would be powered by a rocket and maneuvered in flight by thrusters. Sections behind radar antenna in this schematic drawing would be jettisoned before the craft re-enters the atmosphere to land at a jet airport.

be jettisoned before the vehicle re-entered the earth's atmosphere.

The shape of NERO's body, with its broad rounded belly, "is designed with a winglike lift to enable the vehicle to glide to a landing on a jet airport." Plans call for the addition of a 4,500-pound-thrust jet engine to provide maneuverability.—John Noble Wilford, © The New York Times, December 6, 1966.

Geophysics—20 Years On

Progress towards arms control, the prediction of earthquakes and other natural disasters, accurate long-range weather forecasting, and instrumented surveys of Mars and Venus: these are among the achievements in geophysics during the next two decades forecast by Frank Press, Head of M.I.T.'s Department of Geology and Geophysics, in the keynote address at the annual meeting of the Society of Exploration Geophysicists last November. Speaking on "Geophysics in Man's Expanding Domain," Dr. Press pointed out that geophysics is now involved at every level of man's achievement and well-being, from making available his natural resources to providing the technical background for arms control and exploration of the solar system.

The wide vistas now opening to geophysicists are the results of technical progress during the last decade. Among notable contributions to the technology of geophysics in this period have been the growth of digital data acquisition and processing, the development of large seismic arrays and long-period seismographs, and advances in paleomagnetism, magnetic and gravimetric surveys, and satellite geodesy.

In answering the question of what progress geophysicists can hope to make in the near future, Dr. Press predicted a number of certainties. Increasing pressure of population, combined with exploding industrialization in the newly emerging nations, will accelerate the search for oil and minerals. New mineral provinces will open, and offshore exploration will move into deeper waters. This revolution in oil exploration will very likely embrace

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the mining industry also, even though mining on the deep sea floor is probably further away than just around the corner. But the ocean deeps do hold great promise for studies in basic geophysics: "The sea floor will hold comprehensive geophysical observatories measuring seismic activity, temperature, pressure, gravitational field, electrical conductivity, magnetic field, heat flow, currents, etc." In fact, as the oil companies and service companies move in on these enterprises the distinction between applied and basic geophysics will gradually blur.

How will geophysicists contribute to predicting and controlling natural forces? Although weather modification is perhaps beyond the horizon, Dr. Press foresees progress in forecasting: "Numerical long-range forecasting is probably solved in principle right now, but awaits advances in computer technology." And seismologists will make intensive efforts to set up arrays for earthquake prediction. The Federal Council for Science and Technology is now reviewing a report calling for a 10-year, \$140-million program aimed at earthquake prediction and advances in seismic engineering. Just as important, new techniques are making the subject respectable in the eyes of geophysicists: ". . . although no scientist could possibly guarantee that a successful prediction scheme will emerge, the fact that so many first-class people are willing to work on the program is again some reason for optimism."

Some of the most profound effects for man and science will arise from space and planetary physics. Already our technology is ready for the challenge of sampling another member of our solar system: ". . . the first emplaced scientific package on the lunar surface will reveal more about the lunar interior in one year than a hundred observatories operating for three decades have revealed about the earth's interior. This is because lunar exploration begins immediately with long waves and free oscillations, with heat flow and gamma-ray spectroscopy, with fossil magnetism—subjects which did not evolve on the earth until very recently."

But if geophysics is to claim these dividends, the profession must earn them, Dr. Press warned. It must become involved with the universities, and think about the relationships between universities and industry. Industry must be prepared to let recruits think for themselves and set their own pace. And the profession as a whole should embark on an advertising drive to emphasize the opportunities available in geophysics.

In his summary, Dr. Press returned to the general theme: ". . . Man's domain is expanding, and geophysicists are full participants in this trend. If anyone doubts this, let him remember that the first scientists to venture to the bottom of the deepest oceans were earth scientists. The first scientist to step on the surface of the moon will probably be an earth scientist. Equally, if not more, important, the first scientist to spark the economy of a newly emerging nation is typically an earth scientist."

75 Years from Throop to Caltech

There are Pasadenas in Texas and Maryland, too, but to most of us it is the one in California that counts. It does so because of the Rose Bowl and, especially, because of

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—SEMON E. KNUDSEN, '36, Executive Vice-president of General Motors Corporation, upon his acceptance of honorary membership in Delta Sigma Pi at the University of Michigan.

the California Institute of Technology, which celebrated its 75th anniversary late in 1966.

Caltech began as Throop University, an overambitious gleam in the eyes of Amos G. Throop and a group of Universalists who had elected him as their moderator. Four months after the first classes opened the trustees saw failure written on the wall and changed their university into "a school that is sadly needed in the West—one for the teaching of those things that train the hand and the brain for the best work of life. . . . The field of industrial training is open and wide," they said, "and we propose to occupy it."

By 1910 Throop Polytechnic Institute had acquired its present campus, then on the southeastern edge of Pasadena. Three years later Arthur A. Noyes, '86, Director of the Research Laboratory of Physical Chemistry at M.I.T., came to Pasadena to plan a new chemistry building; he stayed to become director of chemical research, to help create an institution "which he outspokenly hoped might someday surpass the one he had left," and to open a lively traffic of people and ideas

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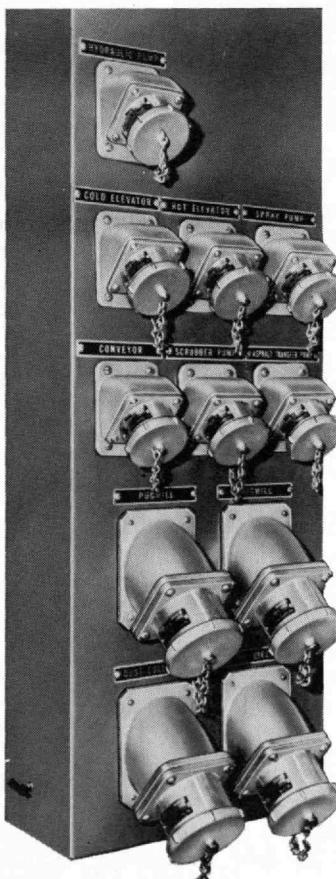
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The Trend of Affairs

between Cambridge and Pasadena which has persisted with profit to both institutions ever since. The pattern was reinforced in 1946 when Lee A. DuBridge, Director of the M.I.T. Radiation Laboratory, became president of Caltech. (The name was changed in 1920, when Robert A. Millikan became president.)

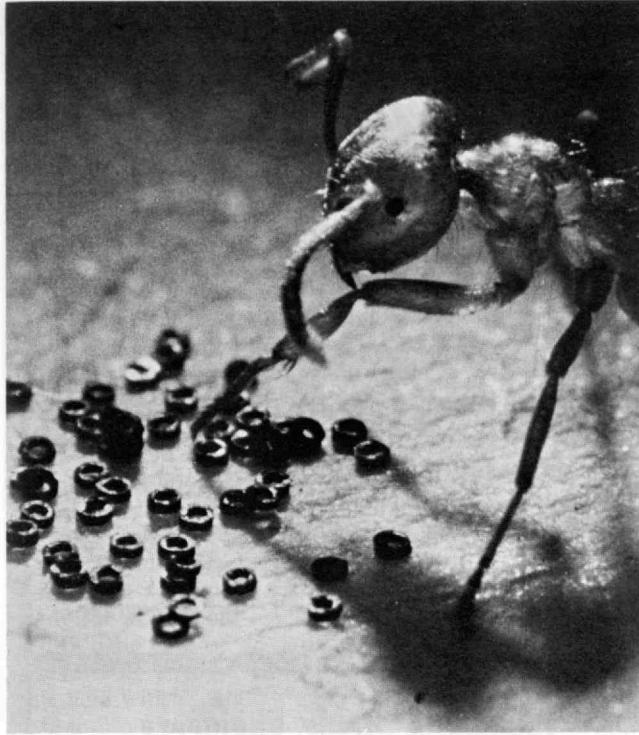
Today 64 per cent of Caltech's graduates are under 40, their average salary is about \$1,800 higher than that of all college graduates, and one in every 14 has 200 or more men under him. The student body is small —about 1,500, with a freshman class of about 200. Caltech claims connections with 11 Nobel prizes: three winners are now on the faculty, four others received the honor while teaching there, and six alumni are Nobel laureates. On its faculty rolls have been such men as George W. Beadle, Albert Einstein, Richard P. Feynman, '39, Murray Gell-Mann, '51, George Ellery Hale, '90, Robert Oppenheimer, Linus Pauling, Robert L. Sinsheimer, '41, Wallace Sterling, and Theodore von Karman. *Fortune* magazine has called it "probably America's richest concentration of talents in fundamental science."

Two of Caltech's claims to fame are the great observatories of Mt. Wilson and Mt. Palomar. Another is the Jet Propulsion Laboratory, operated for the National Aeronautics and Space Administration, which has grown to employ more people, spend more money, and gain more world attention than its parent.

To celebrate its 75th anniversary, Caltech mounted a three-day conference on Scientific Progress and Human Values, a "hard look at ourselves, at the world of science and technology of which we are a part, and at the world of human beings who may benefit or suffer from what we do," said Dr. DuBridge. James R. Killian, Jr., '26, Chairman of the Corporation, was M.I.T.'s official delegate.

Among the speakers and their remarks, as reported in the press:

- Murray Gell-Mann, '51, professor of theoretical physics at Caltech: society must give new directions to technology, diverting it from applications that yield higher productive efficiency into areas that yield greater human satisfaction.
- Simon Ramo, vice-chairman of TRW, Inc.: "Technology is moving faster than our ability to assimilate it." We must create a new class of men, socio-technologists, who can "effectively link scientific developments with social betterment."
- Herbert J. Muller, professor of English and government at the University of Indiana: "The popular American standards of material wealth and power or technological efficiency are obviously inadequate." The standard must involve moral, cultural, and spiritual values, the kinds of achievements recognized in our understanding of the great societies and the golden ages in the past.
- Robert S. Morison, director of the Division of Biological Sciences at Cornell University: the family is "a fine mechanism for transmitting conventional wisdom in a relatively static society, but it is relatively poor at assimilating and transmitting new knowledge essential to survival in a rapidly moving world."



Computer memory cores—tiny doughnuts of magnetic material—are shrinking almost to invisibility. In the picture, an ant species of average size dwarfs some experimental magnetic cores made at International Business Machines Corporation by a new method involving a nylon filament passing through a bath of varnish and magnetic powder. The magnetic core is the basic storage element used in the memory of most modern digital computers; the original invention is credited to Jay W. Forrester, '45, and his associates in the M.I.T. Digital Computer Laboratory in 1949.

- James Bonner, professor of biology at Caltech: biologists are on the verge of finding a way to eliminate senility; they will soon also be able to control reproduction, determine the most attractive life spans, and, in general, direct the process of evolution.
- Jesse L. Greenstein, professor of astrophysics at Caltech: dreams of ultimate space travel are "pure fantasy," and the chances of communicating with life in space are dim. "If the nearest civilization were 10,000 light-years away—a reasonable assumption—then we would need an aerial as large as the earth to catch its signals." Yet interstellar communications "may ultimately become the greatest scientific adventure."
- Robert P. Sharp, professor of geology at Caltech: earth scientists, now intent upon learning about distant planets and stars, should also "look downward into our own planet. Our understanding of these distant bodies will depend to a good degree upon how well we understand our own plain earth."
- John R. Pierce, director of the Research-Communications Sciences Division, Bell Telephone Laboratories: satellites are yielding revolutionary improvements in communication on earth which will transform society by abolishing distance as a factor in the cost or use of electrical communications.

William Shockley, '36, professor of engineering science at Stanford University, was among 23 Caltech alumni receiving distinguished service awards during the celebrations; another was Charles H. Townes, Institute Professor and Professor of Physics at M.I.T.

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No Right Angles

The long-term interests of the faculty and the expectations of students together are a "tremendous stabilizer" to the course of M.I.T., Howard W. Johnson, its new President, told Howard Spergel in an interview published in the first issue of *The Chronicle of Higher Education* late in November.

"There will be no right-angle turns," President Johnson said.

Replying to Mr. Spergel's question about ideas to be nurtured by the new administration, President Johnson said he is "very strong" for encouraging "some oases of serenity, some areas of peace and quiet for the development of basic-science ideas. I'm very strong for this. Those members of our faculty who choose to work at the fundamental edge of the research in their field will be strongly encouraged to do so."

And, he said, urban problems—including "the whole system of problems related to city planning, regional economic development, education development," have "major priority" for M.I.T.

"I see a growing concern for applications of science to human problems, the systems-type problems, whether they relate to industry, urban setting, medicine, or transportation."

Other questions and answers included:

Q. The Federal government seems to be stressing projects that will have practical payoffs. How can M.I.T. resist this pressure?

A. I suppose, in one way, M.I.T. has been more effective in the practical payoff than most institutions. It has had that kind of reputation, and for good reason. So, in a sense, the pressure existed even before what we might describe as a recent concern on the part of the Federal government.

But what I think we've got to recognize in this country is that application is fueled by an immense amount of basic work. Our country doesn't spend enough on basic research. Something more than \$1.5 billion goes to what I would call university research. That's a small amount to pay for the assurance that we will continue to develop a mass of basic work to fuel our progress in applications. I don't see why we can't encourage these "eyes of the hurricane" here at M.I.T. A good many of the new breed you find in our faculty and among our students are interested in problems not related to the Department of Defense. They welcome Federal money in support of life sciences research, urban studies

research, commerce and industrial research.

Q. Are you saying there is a general misconception that M.I.T.'s research with Federal funds is oriented to the Department of Defense?

A. Yes. The major part of the \$126 million is taken up by work at the Lincoln and Instrumentation Laboratories, which are off the campus and are outside the formal academic process.

While the Department of Defense is always important, because M.I.T. takes its responsibility in the defense of this country seriously, we're also heavily involved in other kinds of research. About a third of the current research projects on the M.I.T. campus are devoted to the life sciences.

Q. Are there types of research for the Federal government that M.I.T. will not handle? For example, would you do chemical and biological warfare research for the government?

A. My answer would be no. Now it's possible that a professor would make a case to the provost that there would be some piece of research in a field in which he saw important scientific questions and would justify it on those grounds. I think we would require a very solid case for that.

And it is unlikely that we would enter a classified project without carefully weighing all the pluses and minuses, without having a fairly clear faculty acceptance of the idea before we went ahead with it.

Q. What is your reaction to the argument that Federal support of centers of excellence should be spread evenly throughout all regions of the

President Howard W. Johnson accepts a gift from Cambridge Mayor Daniel J. Hayes after addressing the annual meeting of the Cambridge Chamber of Commerce. The package contained inscribed bookends designed by the mayor around the city seal.

PHOTO: ED PACHECO



country?

A. I'm for building new centers of strength in research and teaching. But to do it at the cost of pulling down or reducing the quality of effort in great centers of the country would be, I think, a national mistake.

Q. The morality of the scientist has been the subject of a long debate—how responsible he feels for the effects of his work. Is this an issue at M.I.T.?

A. I think not. For one thing, the scientist, the engineer, and the professor in general applies to his work a higher standard of concern for his own sense of integrity than most people could imagine. Science itself is not moral or immoral. It is amoral. The uses of it are the concern of everybody, and most scientists are deeply concerned about the possible uses and misuses of the work they do.

But every scientist must follow his field to its full extent. He has to go where it leads, and the only stipulation is that most of us would prefer—indeed would insist on—the full and free publication of results.

Q. One final, inevitable question, Mr. Johnson. At this point, are you bored or annoyed with comparisons between you and Howard Johnson, the restaurateur?

A. They roll off my back, by now. The nicest thing anybody has said to me on this score recently is what a friend of mine said, after I became president. The next time he saw the other Howard Johnson he was going to say, "Are you any relation to the real Howard Johnson?"—which is normally the question I get.



PHOTOS: ARTHUR A. KALOTKIN, '68

Above: "Here is a Case Unprecedented" brought all the cast of "The Gondoliers" on stage for the final scene of the operetta: Juan Miquel Meyer, '67, as Giuseppe, Jacqueline Meiley and Richard P. Rudy, '68, as the Duchess and Duke of Plaza-Toro, Roberta Eisenhart as Casilda, Karl Deirup, Graduate Student, as Luiz, and Martha Reardon as the Nurse Inez. At right Richard Rudy performs "With Ducal Pomp."



An Institute Gazette

"The Gondoliers"

A delightful evening of confusion was the result of the M.I.T. Gilbert and Sullivan Society's production of "The Gondoliers" presented to enthusiastic audiences on November 17, 18, and 19 in Kresge Auditorium. The confusion was written into the plot in typical Gilbert and Sullivan style: which of the two gondoliers, Marco and Giuseppe (Steven Tamkin from Boston University and Juan Miguel Meyer, '67), is actually the king of Barataria who was married in infancy to Casilda, the daughter of the Duke of Plaza-Toro (Richard P. Rudy, '68), and was then abducted to Venice? Unfortunately, before either of the heroes realizes this complicated state of affairs, they choose wives from the village girls. And Casilda is distressed to learn that she is married because she, alas, dearly loves her father's drummer Luiz (Karl Deirup, an M.I.T. graduate student). But before the final curtain, in Gilbert and Sullivan's inimitable way, everything is unscrambled to assure that everyone can live happily ever after.

However, the intricacies of plot are less important than the music and staging. The music and lyrics are not Gilbert and Sullivan's most impressive collaboration, but the M.I.T. players made the best of it, putting on a thoroughly professional entertainment. Every solo voice was a *good* voice capable of handling the demands of the role.

The chorus of *contadine* and *gondolieri* admirably backed up the principals. The fact that the singers were college students was forgotten. A 32-piece orchestra conducted by Stephan S. Weinberg, '69, completed the professional air of the performance. The staging and musical preparation was under the direction of James Stuart, voice coach at the Boston Conservatory of Music. Ellen Colmer, '68, was production manager.

The M.I.T. Gilbert and Sullivan Society is a new organization at the Institute. Originally conceived in 1960, it took a 25¢ bet that it would never get off the ground before it actually did materialize in 1964 with a concert performance of "The Sorcerer" and "Iolanthe" narrated by Dean Frederick G. Fassett, Jr. Since then it has presented two or three performances a year. The response of the Institute has been overwhelmingly appreciative, so much so, in fact, that last year the Society received the William L. Stuart Award for its contributions to community life.

"But even without this sort of recognition, even without an *audience*," says Ellen Colmer, "we would stage the shows just because we love doing them." This joy in performing was clearly evident in "The Gondoliers."

Charities Drive

Jay Nichols, '68, vice-president of the Technology Community Association, reported returns of \$1425 for the 1966 Charities Drive. The sum is the largest collected since 1958 and shows a \$350

increase over last year's total, but is nevertheless considerably short of the \$2000 proposed goal.

East Campus led the dormitories with donations of \$272. McCormick Hall contributed the largest per capita amount with each girl donating an average of 75¢. Zeta Beta Tau led the fraternities with a total contribution of \$104, and Kappa Sigma's donated \$1.78 per member. Charities aided by the drive included the Cancer Fund, World University Service, United Fund, Muscular Dystrophy, American Field Service, and the United Jewish Appeal.

Parietals Limits Extended

The limits of parietals (girls' visiting hours in the men's dormitories) may be extended under an authorization of the M.I.T. Academic Council (president, provost, vice-presidents, and deans), and Dean Kenneth R. Wadleigh, '43, is now working with dormitory house masters and student governments to put the new plans into effect.

Girls may now visit the dormitories until midnight (instead of 10 p.m., as before) on Mondays through Thursdays, from noon until 2 a.m. (instead of 4 p.m. to 1 a.m.) on Fridays and before holidays, and until 2 a.m. instead of 1 a.m.) on Saturdays (Sunday mornings). Sunday hours are unchanged—from noon until midnight.

Dean Wadleigh, in *The Tech*, emphasized that there must be adequate enforcement of guest rules and a "sign-in sign-out system that works."



PHOTO: OWEN D. FRANKEN, '68



PHOTO: OWEN D. FRANKEN, '68



PHOTO: ARTHUR A. KALOTKIN, '68



PHOTO: ARTHUR A. KALOTKIN, '68

Karen Hunter of the University of Kentucky came to M.I.T. for the "J-P Weekend" in November, and she turned out to be one of five semi-finalists for the honor of J-P Queen. Her escort, Michael L. Rodburg, '68, (and Technology Review's cameras) met her at the airport; took her to the Alpha Epsilon Pi house for lunch and then to Briggs Field for Field Day, the organized freshman-sophomore games. The Class of 1969 won the "bed marathon" by 15 points; but the "unlimited" tug of war went to the Class of 1970, and the sophomore co-eds also ended up in the mud. Then back to Alpha Epsilon Pi . . .



PHOTO: MORRIS J. MARKOVITZ, '68



PHOTO: ARTHUR A. KALOTKIN, '68, FROM THE TECH



PHOTO: OWEN D. FRANKEN, '68

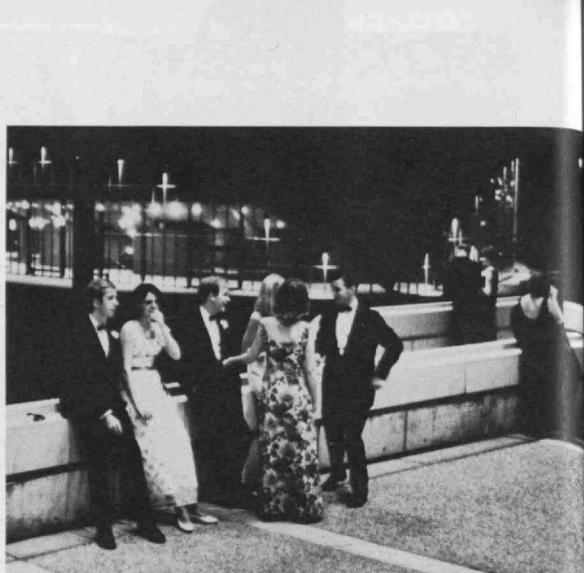


PHOTO: IVAN MASSAR (BLACK STAR)



PHOTO: ARTHUR A. KALOTKIN, '68, FROM THE TECH



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PHOTO: ARTHUR A. KALOTKIN, '68



PHOTO: OWEN D. FRANKEN, '68

... for a few intimate moments before the week-end's highlight, the formal Junior Prom, a champagne ball in the Student Center. Karen's crown turned out to be a "consolation" princess ribbon, but there later developed other and better consolations for all those present. Next day came a special performance by the New York company of "The Fantastics" and a highly informal evening of rock-and-roll merriment in the du Pont Center gymnasium.



PHOTO: ARTHUR A. KALOTKIN, '68



PHOTO: OWEN D. FRANKEN, '68



PHOTO: ARTHUR A. KALOTKIN, '68



J. P. Augustine



J. F. Keil



J. N. Murphy



D. L. Wright



M. U. Clauer



C. R. Wieser, '40

An Institute Gazette

Wisconsin Tragedy

Half-masted flags over M.I.T. during Christmas week carried a message of special pathos and concern: John P. Augustine, '69, John F. Keil, '69, James N. Murphy, Assistant Superintendent of Building Services, and David L. Wright, '67, were killed in a tragic automobile accident at Baldwin, Wisconsin, on December 27.

The four (and a fifth passenger, David B. Arlen, a student at the University of Massachusetts) died just 24 hours after leaving Boston on the way to Minneapolis for the national convention of Alpha Phi Omega, national Boy Scout service fraternity. The students were members and Mr. Murphy was adviser to the M.I.T. chapter, whose activities benefit many aspects of the Institute community.

"In the 37 years since he joined M.I.T. at 15 as a messenger boy, Mr. Murphy had come to represent the highest standard of service and devotion to the Institute," President Howard W. Johnson said in a statement issued upon learning of the accident. "As the first manager of Kresge Auditorium and the M.I.T. Chapel he helped develop the policies which have made them valuable community facilities. His contributions to the planning

and managing of the Julius Adams Stratton Building were equally important. Tireless in his attention to details and with inexhaustible patience in dealing with complex problems, he brought to his assignment a warmth and understanding which made him one of the most loved of our staff members."

When Mr. Murphy was given a special honor at the 1962 Awards Convocation, Julius A. Stratton, '23, then President of M.I.T., told him. "There is hardly anyone at M.I.T. who has not been the beneficiary of your generous spirit."

Mr. Wright, a senior majoring in mechanical engineering, came from Baldwinsville, N. Y., and lived in Senior House. As service vice-president of the M.I.T. chapter of A.P.O., he had been instrumental in organizing community relations projects.

Mr. Augustine's home was in Phoenix, Ariz.; he lived in Burton House where he had been honored by election as a steward of the dining hall staff this fall; his major was electrical engineering and he had an active interest in Air Force R.O.T.C.

Mr. Keil, a sophomore in chemistry, lived in Baker House; his home was in Hasbrouck Heights, N. J. He was historian of the A.P.O. chapter and principal producer of a film to be shown in Minneapolis, inviting the 1968 national convention of A.P.O. to Boston.

Doing their homework: members of the Alumni Fund Board visit the dormitories to see recent improvements made possible by Fund allocations and learn continuing needs in the dormitory system. In Burton House their visit was led by Phillip H. Peters, '37, Chairman of the Board (center), and they were conducted by William L. Hsu, '67, President of Burton House (left center), and Laurence H. Bishoff, '59, director of housing and dining services (right).



Lincoln Laboratory Heads

Milton U. Clauer, a California Institute of Technology graduate and aeronautical industry executive who has been director of the Research and Engineering Division of the Institute for Defense Analyses for the past year, is the new director of M.I.T.'s Lincoln Laboratory.

C. Robert Wieser, '40, who has been acting director since the death last May of William H. Radford, '32, then director of the Laboratory, is associate director.

Under their leadership, said M.I.T. President Howard W. Johnson in announcing the appointments, Lincoln Laboratory "will continue to contribute creatively to vital national needs, as it has since its inception in 1951. In addition, we look forward to the development of stronger ties between Lincoln Laboratory and the scientific programs of the Institute."

Dr. Clauer, who also serves as professor of aeronautical engineering on the M.I.T. faculty, holds three degrees in aeronautics from Caltech (B.S., 1934; M.S., 1935; and Ph.D., 1937). His professional career includes 13 years with the Douglas Aircraft Co., four years as head of the School of Aeronautics at Purdue University, six years as vice-president and director of research of Space Technology Laboratories, Inc., and five years as president and chairman of the Clauer Technology Corporation, which he organized in 1960. He has been active on various scientific advisory committees to Federal agencies and as a consultant to industry.

Mr. Wieser has been at M.I.T. ever since he came in the Class of 1940 to study electrical engineering. After graduation he joined the Servomechanisms Laboratory to work on fire control systems, then served in turn in the Digital Computer Laboratory (studies of the use of the Whirlwind I computer to air traffic control and air defense), Lincoln Laboratory's SAGE design group (computer-controlled aircraft interception), and the Lincoln Laboratory data systems division (Apollo and ballistic missile reentry systems). He became assistant director of Lincoln Laboratory in 1964.

We're in Irons

350 Yachtsmen Find M.I.T.
Like Pemaquid: Sharp,
Rough, and Foggy

By John Rendel
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Some of the country's leading scientists in sail put their equations on the line for almost 12 solid hours at the Massachusetts Institute of Technology on November 9. Several experienced, but less erudite, sailing men acknowledged that they understood less than 10 per cent of what they were told, but whatever it was they were for it and thought the researchers should be encouraged.

The occasion was what may have been America's first exhaustive symposium on the advanced techniques of yachting. The sponsors, the Department of Naval Architecture and Marine Engineering, expected that about 60 would attend. Instead, 350 sat through the morning and afternoon sessions at the Kresge Little Theater Auditorium. They heard lectures on sail and hull research, complete with slides, graphs,

The aerodynamics of a sailing yacht is no simple problem: there is force of wind on hull and sails, both of which act as lifting surfaces under many conditions, and superimposed on this is the interaction of wind and water as two related fluids. Wind tunnel tests on ship models, such as this conducted in the Wright Brothers Wind Tunnel at M.I.T., are designed to yield new understanding of sail forces and their relationships to sail parameters.

motion pictures and endless geometric equations. Half of them stayed for more of the same at dinner.

Halsey C. Herreshoff, a tall, slim, young M.I.T. instructor in naval architecture, is in charge of coordinating the sail research program. He supplied a good many of the 100,000 or more words that were delivered. Among the things he said was that the computer opened up exciting new horizons that never had been possible through mental calculations. He said that the two-year-old program had used up \$40,000 of donated funds and that the till was empty.

For Children and Grandchildren

Ted Hood, the gifted Boston sailmaker-designer-helmsman waxed what for him was almost loquacious. In essence, he said that while practical applications of the new knowledge were few, what was being learned would be of immense value to this generation's children and grandchildren.

Ed Raymond, also a sailmaker and expert helmsman, came right out and said what Herreshoff had only implied. Cash contributions were badly needed if the efforts toward more efficient sailboats were to continue, he said. Palmer Sparkman, who originated the research program with Olin Stephens, said that the donations should be sent to M.I.T.'s Department of Naval Architecture. They are tax deductible.

There were talks on hull research, model testing, stability and control in quartering seas, yacht research in England and sail research and design in this country. Aiding Herreshoff on sail

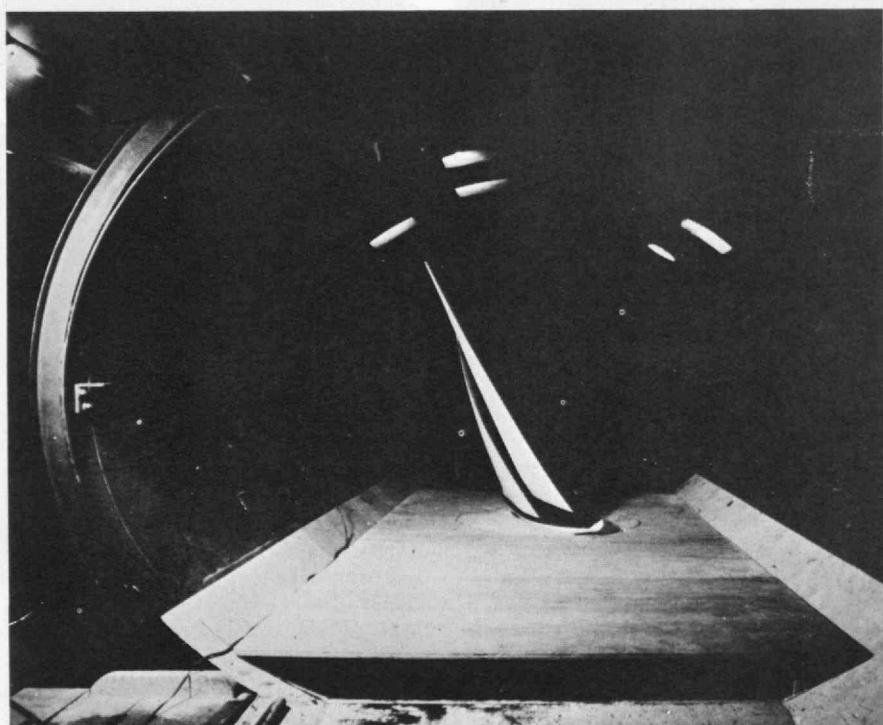
design was Dr. Jerome Milgrim, a research associate and sailmaker. He confounded the audience with rows and rows of figures that showed how computers could lead to more effective sails and other rows that told sailmakers how to cut them.

Fuzzy Mental Fog

In the late afternoon the gathering, whose members included many leading racing men, was broken down into more manageable small groups and taken on a guided tour of M.I.T.'s facilities. Among those present were William J. Strawbridge, the manager of the Intrepid Syndicate, which is building an America's Cup candidate, and Bus Mosbacher and Bob McCullough, other leaders in the enterprise against the Australians.

The tour included crowding into a small room where an operator sat at a console he called a glorified typewriter. He fed yacht dimensions, wind velocity and direction into the central computer system. Out would come the precise knots that the theoretical yacht would make good under different wind conditions. For once a computer got funny. Instead of the expected mathematical computations, the words "Back the jib; we're in irons!" were flashed on two closed-circuit television screens.

There was a visit also to the handsome towing tank. A model of a 12-meter yacht was made to back and fill at various angles of heel and degrees of speed. Everybody thought it a day well spent despite a considerable amount of fuzzy mental fog on the premises.



Innovations Musical

The 1966-1967 musical year at M.I.T. has made a prosperous beginning with some significant innovations, most of them furthering the plan of acquainting the amateur musicians of the Institute community with professional talent. Joseph Silverstein, concertmaster and first violinist with the Boston Symphony, appeared as soloist with the M.I.T. Symphony in its first concert of the year. Violinist Sonja Monosoff will add her professional experience as director of string ensembles for the academic year; Miss Monosoff has participated in the Casals Festivals and has played with the Pro Musica Antiqua under the late Noel Greenberg. The jazz band—a leading collegiate exponent of "big band" jazz—continues under the direction of Herb Pomeroy.

Elliott Carter, Jr., one of the foremost composers to emerge after World War II, is another new addition to the music staff at M.I.T. during the current semester. His undergraduate course on Trends in Contemporary Music has found a large audience, and as a supplement to it he is giving four public lectures dealing with continuity and time in music and with the influence of music on society. In addition, Professor Carter will participate in the Humanities senior seminar. Professor Carter is an American composer of the first rank; his First Piano Concerto will be performed by the Boston Symphony Orchestra this season, and a concert of his music (including his Second String Quartet and Eight Etudes on a Fantasy for Woodwinds) will be presented by the Lenox String Quartet and members of the Dorian Wind Quintet on January 15.

M.I.T. also has new appeal for the serious music student. The addition of a full-scale humanities major to the undergraduate curriculum, allowing greater freedom of choice to students with multiple aptitudes, is of greatest significance: After the sophomore year, no scientific subjects are required; instead, students choose major and minor subjects from such fields as history, literature, philosophy, music, and the visual arts. The Music Section of the Humanities Department, well-established and steadily growing, has equipment and staff for work in the musical aspects of acoustics, communication, music library science, musical instrumentation and music management, as well as the usual musicology and music appreciation courses—a range clearly broad enough to interest a potential music major.



PHOTOS: IVAN MASSAR (BLACK STAR)

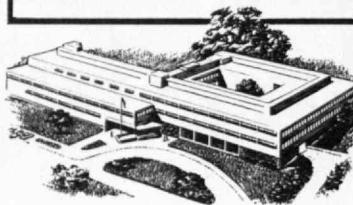
When Joseph Silverstein appeared as soloist in Beethoven's *D-major Concerto* with the several score students who played in the M.I.T. Symphony in Kresge Auditorium in December, Boston *Globe* reviewer David Stock said he showed the mark of a "truly outstanding performer" by "pulling his fellow performers up with him." And David Epstein, conductor, was praised, too: The spirit of the work, said Mr. Stock, "was projected admirably by all." (The concert also included the first Boston performance of *Sinfonietta* by Leon Janacek, "a rousing, fresh work," said Mr. Stock.

Mr. Silverstein's popularity with the orchestra was obvious by their greeting following his performance (right) and by their enthusiasm at a "jam session" after the first rehearsal (left).



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PHOTO: ARTHUR A. KALOTKIN, '68, FROM THE TECH

The season opened for the M.I.T. Concert Band last fall with a successful plaza concert on the steps of the Stratton Building. John D. Corley, Jr., Assistant Director of Music, conducted.

An Institute Gazette

The idea that music at M.I.T. will increasingly make use of the Institute's scientific and technical resources for analysis and creation is an exciting one. Ercolino Ferretti, a lecturer in the Department of Humanities, whose computer music has a liveliness that belies its mechanical origin, is preparing for the day when advanced courses in computer music are standard for all M.I.T. music students. Mr. Ferretti, concerned especially about the student who hesitates to express himself creatively, hopes that the field of computer music may serve as a natural testing ground and that it may help to fuse logical minds with creative impulses. Mr. Ferretti and others look forward to the day when a Ph.D. in music, comprising fields of concentration in music history, aesthetics, new tools for musicology and composition and music library techniques, will be obtainable at M.I.T.

On November 1 Miss Monosoff and Gregory Tucker, professor of music, introduced a series of musical events scheduled on weekday afternoons and evenings and during noon hours with a recital that included works of Bach and Beethoven and the Stravinsky *Duo Concertant*. A program of contemporary American chamber music followed in a concert by Jean and Kenneth Wentworth, faculty members at Sarah Lawrence College, and the third Chamber Series event presented the Pacific String Trio featuring the String Trio by David

Epstein, Associate Professor of Music and conductor of the M.I.T. Symphony. This Chamber Series is an outgrowth of the Library Concerts begun in 1952 and last year moved to the Student Center because of its increasing popularity.

Still less formal are Thursday noon-hour recitals which give as-yet-little-known soloists and student groups an opportunity to perform before an audience and to broaden the musical experience of the M.I.T. community. John Cook, lecturer, Institute organist and originator of the series, arranges choral and instrumental groups as well as singers and organists.—Elizabeth Scanlon

Sports Mid-Season

Winter-season sports began at M.I.T. with some guarded optimism.

Helge K. Bjaaland, '67, could be M.I.T.'s first national collegiate skiing champion. He led last year's team with a third-place showing in the eastern and eleventh in the national collegiate cross country championships.

With a record of 18 wins, eight losses last year and four of last year's starting line-up back, things look bright for the varsity basketball season. Forward David G. Jansson, '68, (6'4") may be the best-ever basketball forward at M.I.T., and co-captain Alexander D. Wilson, '67, who stands 6'5", is back after scoring 559 points last year for the highest single season total in M.I.T. history.

Seven lettermen are back to bolster the swimming team's victory chances, and sophomore Luis A. Clare joins the squad after setting several M.I.T. freshmen marks in freestyle and but-

terfly events last year.

The varsity schedules in January include: *Basketball*: games at home on January 6 (Bowdoin), 7 (Bates), and 17 (New Hampshire); at Colby on January 13 and Bates on January 14.

Fencing: matches at home on January 7 (Trinity) and 14 (Stevens).

Hockey: Worcester at home on January 5; games at Wesleyan on January 12 and Connecticut on January 14.

Rifle: matches at home on January 13 (Northeastern) and 14 (Boston College).

Skiing: the Putney, Vermont, relays on January 24 and 25.

Squash: Home games on January 6 (Williams) and January 10 (Harvard); games away on January 7 (Wesleyan), and January 13 (Princeton), and January 14 (Navy).

Swimming: Meets at home with Williams (January 7) and Wesleyan (January 14).

Track: The team will host Columbia on January 7 and Colby on January 13 and will participate in the Knights of Columbus meet (January 14) and the Boston Athletic Association meet (January 28) in Boston Garden.

Wrestling: Matches at Connecticut on January 7 and Worcester Polytechnic Institute on January 17, with Wesleyan at home on January 14.

Alumni in the White House

Since September two M.I.T. Alumni have been treading the corridors of power in the White House in the role of White House Fellows selected for a one-year intensive learning experience in the Federal establishment.

They follow in the path of Richard de Neufville, '60, assistant professor in the M.I.T. Department of Civil Engineering, who completed his work as White House Fellow in August. His tour in the White House—and the selection of two M.I.T. Alumni for the 1966-1967 program—brought home to Dr. de Neufville the urgent necessity for dialogue between government and technology:

"In response to the public concern, the President and his advisers are directing increasing attention to the implications of the technological revolution. Government is now acutely conscious that it has a moral responsibility to control and guide the development of science and technology.

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An Institute Gazette

to the challenge."

The year-old White House Fellows program is planned to give a group of "extremely promising" young men a direct insight into the operations of the Federal government through work at a high level within the Executive Branch. The Fellows, between 23 and 35 at the beginning of the program, are selected by nation-wide competition, the criterion for selection being their promise of providing the kind of leadership that will influence the shape of American society within the next 10 to 20 years.

After a month's intensive briefing with high-ranking officials, the Fellows are thrown into the deep end of Federal administration: four of them go to the White House staff, one to the office of the Vice President, and the others to the staffs of members of the Cabinet.

Woes in Cambridge

Alarmed at the city's growing traffic and parking woes, the Cambridge City Council has passed an "Order in Council" asking that M.I.T., Harvard and Radcliffe forbid their undergraduates living in Cambridge to own cars.

Pointing out that an "Order in Council" is no more than a request from the city, *The Tech*'s editorial response was, "The City Council undoubtedly has its hands full dealing with the problems facing Cambridge, but it should realize that irresponsible suggestions aren't going to help the situation."

The Winner vs. Moscow

A computer at Stanford University has just defeated one at the Carnegie Institute of Technology, and the winner is now taking on a third in Moscow.

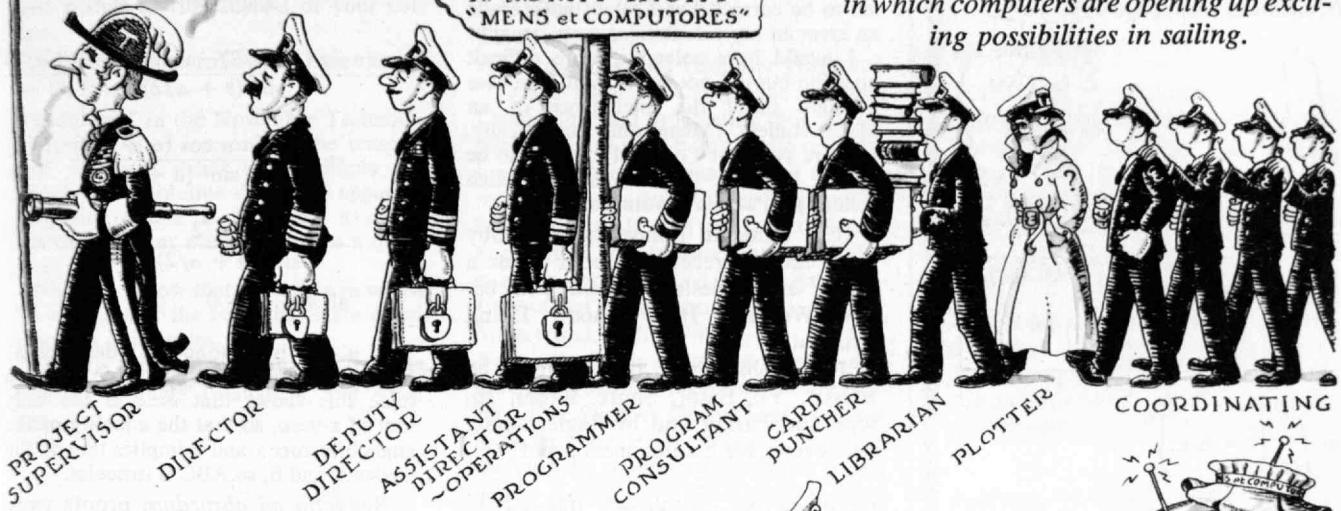
The game is chess, and Stanford's winning chess-playing program was written at M.I.T. by John McCarthy when he was a member of the Department of Electrical Engineering in 1957. The program was actually brought to a game-playing state by four M.I.T. undergraduates in 1960.

Further improvements have been made since then at M.I.T. and later at Stanford, where Dr. McCarthy is now professor of computer science. But, Dr. McCarthy told *The New York Times*, it is still "rather weak by human standards."

This is not as frivolous a way of using a computer as many may think. "Chess provides a way of testing algorithms for making machines behave intelligently under conditions in which the results are easy to evaluate," Dr. McCarthy said.

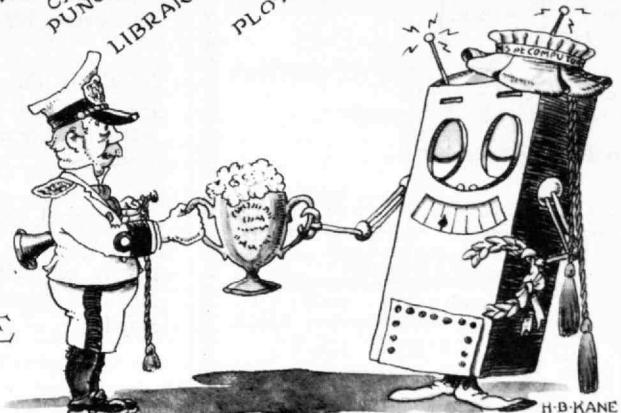
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Review Appointments

The appointments of Richard F. Wright as Advertising Manager and Peter Gwynne as Acting Managing Editor of Technology Review have been announced by Donald P. Severance, '38, Publisher.

Mr. Wright served as Advertising Manager on a part-time basis during the 1965-1966 year and this year has joined the Alumni Association staff on a full-time basis. He brings to Technology Review nearly 20 years of advertising sales experience, starting in 1947 when he joined the national advertising department of the Boston Post. More recently he was advertising director of New Englander, a regional business news magazine published by the New England Council for Economic Development. A graduate of the Huntington School (1943), Mr. Wright attended Babson Institute in 1947.

Mr. Gwynne came to Technology Review on November 15, from the British science magazine Discovery, where he had been Assistant Editor, writing news articles and editing scientific papers in many different fields. Mr. Gwynne studied metallurgy at Oxford University (B.A., 1963) and continued there for one year in materials science research. He was then briefly on the research staff of the University of Sus-

sex before joining Discovery magazine in November, 1964.

Chamber Director

Walter L. Milne, Assistant to the Chairman of the Corporation at M.I.T., is now on the Board of Directors of the Cambridge Chamber of Commerce.

Mr. Milne's Chamber of Commerce assignment comes within only a few months of his appointment to new duties at M.I.T. He came to the Institute in 1951 for work in the News Service and later the Office of Public Relations, and in 1958 he became Assistant to the President.

A Kennedy Memorial

Two members of the M.I.T. community have been named to the planning committee for an Institute of Politics at Harvard University; further cooperation between the two institutions in the field of political science is implied by the announcement. The two committee members are William W. Kaufmann, Professor of Political Science, and Daniel P. Moynihan, Director of the Joint Center for Urban Studies.

Harvard's Institute is part of the newly-named John Fitzgerald Kennedy School of Government at Harvard, formerly the School of Public Administration. It is eventually to be located

Computers Widen Sailing Scope
Cambridge, Mass.—350 leading yachtsmen heard MIT scientists describe ways in which computers are opening up exciting possibilities in sailing.

Puzzle Corner

(Continued from page 11)

$$\begin{aligned}
 & \int_1^e \left(\frac{\pi}{2} - \tan^{-1} x + \frac{\sum_{k=1}^{\infty} (-1)^{k+1}}{(2k+1) x^{2k+1}} \right) dx \\
 &= \int_1^e \left(\frac{\pi}{2} - \frac{\pi}{2} + \frac{1}{x} - \frac{\sum_{k=1}^{\infty} (-1)^{k+1}}{(2k+1) x^{2k+1}} + \frac{\sum_{k=1}^{\infty} (-1)^{k+1}}{(2k+1) \times 2^{k+1}} \right) dx \\
 &= \int_1^e \frac{dx}{x} = \ln x \Big|_1^e \\
 &= 1 - \frac{1}{2}(e^{i\alpha} - e^{-i\alpha})^2 \\
 &= 2 \left(\frac{1}{4^{12}} (e^{i\alpha} - e^{-i\alpha})^2 \right) \\
 &= 2 \sin^2 \alpha = 1 - \cos 2\alpha \\
 &= - \sum_{n=0}^{\infty} \frac{\cosh y \sqrt{1 - \tanh^2 y}}{\left(\sum_{j=0}^{\infty} \frac{\cosh \gamma \sqrt{1 - \tanh^2 \gamma}}{2^j} \right)^n} \\
 &= - \sum_{n=0}^{\infty} \frac{1}{\left(\sum_{j=0}^{\infty} \frac{1}{2^j} \right)^n}
 \end{aligned}$$

(from the identity $\cosh y = \frac{1}{\sqrt{1 - \tanh^2 y}}$)

$$= - \sum \frac{1}{2^n} = -2 \text{ (from the sum of a geometric series)}$$

$$\therefore \text{the expression equals } 1 + 1 - \cos 2\alpha + \cos 2\alpha - 2 = 0$$

Messrs. Zagier and Shure solved this problem as well.

4—What nonzero five-digit number has its digits reversed when multiplied by 4?

The following was received from Lawrence N. Smith, '68, who says the answer was arrived at by "sheer randomness":

21978
4
87912

I received the following card from Thomas C. Lawford, Jr., '61, whose accuracy at solving puzzles is rivaled only by his fine judgment:

Answer to your puzzle problem 4 is 21978. (21978) (4)=87912. Appreciate your puzzle page, looks like a good idea to me. Best luck.

The following letter brought me particular joy:

I believe I have the solution to number 4: Would you believe 21978? It appears to me to be correct, but I might have made an error in my calculations—per usual.

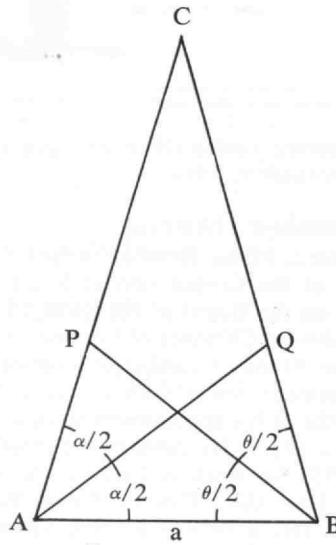
I would have solved a more difficult question but did not feel I should, in case I might insult the intelligence of an M.I.T. student. (Meant only sarcastically, I assure you. For I can only profess to be of the Class of '67 at Wellesley High School.)—Patricia Severance.

It is quite an honor for a grubby Tech tool to receive a letter from a senior at Wellesley—would you believe Wellesley High School? Thank you, Pat.

This problem was also answered by Messrs. Yu, Bator, Shure, Krebs, Joseph and Parker and by Zagier again, who even gave a uniqueness proof!

5—Prove the well-known theorem in geometry that if two angle bisectors of a triangle are equal, then the triangle is isosceles.

As usual, Zagier solved the problem. My proof has the advantage of being purely geometrical but his is so much hairier I cannot resist printing it instead.



We show that if one of the bisected angles is α , the other is also. Let AB be of length a , $\angle CAB = \alpha$. Let angle $QBA = \theta$, so that AQ bisects A , BP bisects B , $AQ = Y$, $BP = X$. We have to show that $X = Y$ implies $\theta = \alpha$. The sine law in ABP gives

$$\frac{x}{\sin \alpha} = \frac{\alpha}{\sin(\pi - \alpha - \theta/2)} \text{ or}$$

$$x = \frac{a \sin \alpha}{\sin(\alpha + \theta/2)}$$

and similarly from ABQ ,

$$Y = \frac{a \sin \theta}{\sin(\theta + \alpha/2)}$$

Hence, $\frac{d}{d\theta} (x - y)$

$$= - \frac{a \sin \alpha \cos(\alpha + \theta/2)}{2 \sin^2(\alpha + \theta/2)} -$$

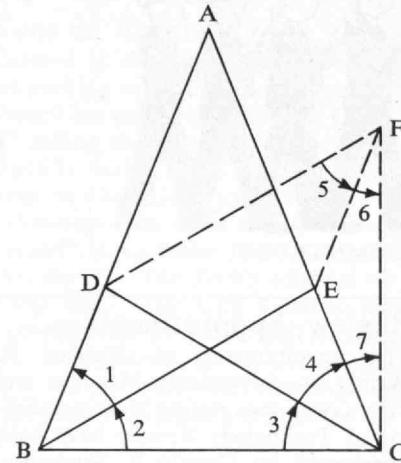
$$\frac{a \cos \theta \sin(\theta + \alpha/2) - a \sin \theta \cos(\theta + \alpha/2)}{\sin^2(\theta + \alpha/2)}$$

$$= - \frac{a \sin \alpha \cos(\alpha + \theta/2)}{2 \sin^2(\alpha + \theta/2)}$$

$$- a \frac{\sin \alpha/2}{\sin^2(\theta + \alpha/2)} < 0 \text{ for all } \theta, \alpha, a > 0$$

That is, $x - y$ is a monotone (decreasing) function of θ . Since plainly $x - y = 0$ when $\theta = \alpha$, this shows that $\theta = \alpha$ is the only root of $x - y = 0$, so that the equality of the angle bisectors x and y implies that of the angles A and B , so ABC is isosceles.

Reductio ad absurdum proofs were submitted by Messrs. Shure and Joseph. My nickel came up heads, so here is Mr. Shure's version:



Given $BE = CD$, angle 1 = angle 2, angle 3 = angle 4.

Prove $AB = AC$ or angle 1 = angle 3 = angle 2 = angle 4.

Construct $DF \parallel BE$ and $DF = BE$, making $DFEB$ a parallelogram.

Angle 1 = angle 5: opposite angles of a parallelogram are equal.

$DF = BE = CD$: by construction and given.

Angle 5 + angle 6 = angle 4 + angle 7: base angles of an isosceles triangle are equal.

If angle 1 > angle 4, then angle 5 > angle 4: angle 1 = angle 5.

Therefore angle 7 > angle 6: angle 5 + angle 6 = angle 4 + angle 7.

In triangle EFC , $EF > CE$, since angle 7 > angle 6, and $EF = BD$, since opposite sides of a parallelogram are equal.

$\therefore BD > CE$: $EF > CE$.

In triangles BCD and BCE , $BC = BC$ (identity) and $BE = CD$ (given).

Angle 3 > angle 2 (and therefore angle 4 > angle 1), since $BD > CE$.

But this is an impossibility, since we assumed angle 1 > angle 4.

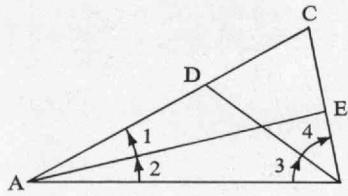
Therefore angle 1=angle 4=angle 3=angle 2 or $BD=CE$ since it can also be shown that the assumption of angle 4 > angle 1 will also lead to an impossibility. Best wishes for the success of your column.

I received the following from Bradley C. Ross, '61:

Problem 5 in the November Technology Review is of interest for the tenacity with which it defies short, simple approaches to a solution despite its apparent simplicity. There is, however, a rather obscure theorem which facilitates a quick proof.

Problem: show that a triangle in which the bisectors of the base angles are equal in length is isosceles.

Given: triangle ABC in which angle 1=angle 2, angle 3=angle 4, and $\overline{AE}=\overline{BD}$.



Theorem: the square of an angle bisector is equal to the difference of the products of the adjacent sides and the segments of the opposite side.

$$\overline{AC} \cdot \overline{AB} - \overline{CE} \cdot \overline{BE} = \overline{AE}^2 - \overline{BD}^2 = \overline{AB} \cdot \overline{BC} - \overline{AD} \cdot \overline{CD}$$

Also

$$\overline{AB} \cdot \overline{CE} = \overline{AC} \cdot \overline{BE} \quad (1)$$

and

$\overline{AB} \cdot \overline{CD} = \overline{BC} \cdot \overline{AD}$, since angle bisectors divide the opposite side in proportion to the adjacent sides.

Thus,

$$(\overline{AD} + \overline{CD}) \cdot \overline{AB} + \overline{AD} \cdot \overline{CD} = \overline{AB} \cdot (\overline{BE} + \overline{CE}) + \overline{CE} \cdot \overline{BE}$$

$$\overline{AD} \cdot (\overline{AB} + \overline{CD}) + \overline{AB} \cdot \overline{CD} = \overline{BE} \cdot (\overline{AB} + \overline{CE}) + \overline{AB} \cdot \overline{CE} \text{ using (1)}$$

$$\overline{AD} \cdot (\overline{AB} + \overline{CD} + \overline{CE}) = \overline{BE} \cdot (\overline{AB} + \overline{CD} + \overline{CE})$$

$$\therefore \overline{AD} = \overline{BE},$$

∴ Triangle AEB is congruent to triangle ABD,

∴ Angle 2=angle 3 and angle 1+angle 2=angle 3+angle 4,

∴ Triangle ABC is isosceles.

The above theorem is not too well known and perhaps deserves a proof.

It does, indeed, and I'll assign it as a problem in the next issue.

In his letter, Yu states, "Concerning #5, I know some guys who'll pay you plenty for its correct proof." The check may be made payable to Allan J. Gottlieb.

Letters on Review

24-Hour Library

To the Editor:

When my husband (Sumner Hayward, '21) and I were in Cambridge last June I was interested in learning that the experiment was then being made of keeping one of the libraries—was it the one in the new Student Center?—open 24 hours a day. If you can conveniently find out if this unique library service is being continued I'd like to know.

ELIZABETH HAYWARD

Ridgewood, N.J., 07450

You are correct about the library, and the "experiment" has now become routine. The Student Center reading room is indeed open 24 hours a day; its shelves are stocked with copies of all books which M.I.T. Faculty have placed on "reserve" for their undergraduate courses. The room is full most of the time, day and night—so full that people who sit in one chair and put their feet on another are criticized not for a breach of etiquette but for using more than one seat. In the fall of 1965, when the reading room opened, 3,000 people a week used it. Last spring the number was 5,000. Now Professor William N. Locke, M.I.T.'s Director of Libraries, has just reported that it serves over 11,000 people per week!—Ed.

"Ceased and Desisted?"

To the Editor:

I hesitate to claim illusions of literacy but you aren't giving me much of a chance since you ceased and desisted sending me Technology Review. The last issue I received at this address was July, 1966. Consider this a fan letter if you will, but as a (contributing) Alumnus and active member of the Educational Council I miss your publication!

Does the computer dislike me?

Do you want more money even though M.I.T. has not hesitated to cash my checks?

Do you feel a 25-year grad is too obsolete to understand the editorial content?

Well, try me! At the very least let me know your demands, terms, and conditions and possibly we can arbitrate the issue. While we're arbitrating, how about the August, September, and October issues?

EDWARD C. TELLING, '42
Cornell, N.Y., 13045

A fan letter for sure, for how many editors can claim this loyalty from their subscribers? As everyone knows by now, the November issue of Technology Review was late, even as this one is. But Technology Review does not publish in August, September, and October.—Ed.

KULITE

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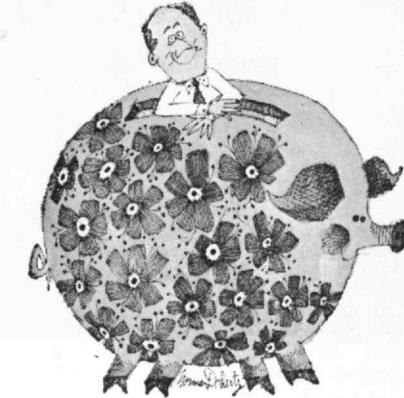
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Anthony D. Kurtz, 1951

Ronald A. Kurtz, 1954

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THIS SPACE CONTRIBUTED BY THE PUBLISHER.

Technology Review
January, 1967

$$\begin{aligned}
N dx + N dy = 0 & \quad f(x) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad -\infty < x < \infty \quad f = ma \quad p = mv \\
f(x) &= \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \\
C_e = e^{\pi\alpha} &= \frac{L}{e^{\nu^2 \rho/2}} \quad V = \frac{(1 + \beta \cos \theta)^*}{\sqrt{1 - \beta^2}} V \quad \Delta_2 \quad \Delta_8 \quad T = \frac{1}{2} m v^2 = \frac{p^2}{2m} \\
C^2 = d\rho/dp & \quad N_i = N \frac{\omega_i e^{-\omega_i/kT}}{B(T)} \quad C = \frac{q}{\Delta \varphi} \\
\Delta E = dQ - dW & \quad P = \frac{kT}{V} \cdot \frac{f(T)}{n(T)} \quad n = \frac{c}{V} = \frac{\nu \lambda}{\lambda'} = \frac{\lambda}{\lambda'} \text{ or } \lambda = n \lambda' \\
ds = \frac{dQ}{T} & \quad \frac{\lambda + \lambda'}{\lambda} = \frac{\mu + \mu'}{\mu} = \frac{\nu + \nu'}{\nu} \\
e \alpha_i = \left(\frac{\partial P_i}{\partial \alpha_i}\right)_E &= \left(\frac{\partial P_i}{\partial E \alpha}\right) u^i \quad \delta y_i = h^2 f(a_i) h, y_i \quad \nabla^2 \phi = 0 \quad \bar{V} = \left(\frac{E_i - E_e}{h}\right) \text{ sec } \bar{\phi} \\
u(t, t_0) \psi(t_0) &= \psi(t) \quad P = \frac{e^{\epsilon \hbar^2 \omega}}{2\pi m^2 c^3} \left| \int \psi_{ne}^* H_i \psi_{k \epsilon \bar{p}} d\tau \right|^2 \\
K = e^{-\Delta F^0/RT} &= e^{\Delta S^0/k} e^{-\Delta H/RT} \quad f: X \rightarrow Y \quad a^2 \nabla^2 \phi = \delta \phi / \delta t \\
R = \frac{(R_e \sigma_e) \sigma_e + (R_h \sigma_h) \sigma_h}{(\sigma_e + \sigma_h)^2} & \quad \sum_{k=1}^n P_k Q = \text{constant} \quad \frac{d^2 \phi}{dt^2} + b \frac{d\phi}{dt} - \frac{d^2 \phi}{dx^2} \\
\overline{\phi^{-1}(P)} &= \phi^{-1}(\overline{\{P\}})
\end{aligned}$$

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SANDIA 

'96

I telephoned **Robert A. Davis**, as a last available resort for news, and Robert answered, "No news, last '96 man I saw was you, at Yarmouth last summer; I have neither seen nor heard from a classmate." At the autumn meeting of the Alumini Council the secretary who announced Michael Driscoll, '41, as an Associate added, "His father is sitting down here." Suggestions for a New Year's resolution, "I resolve to send a line to the Class Notes Secretary more often that '96 may keep out of the also ran list." —**James M. Driscoll**, Secretary, 129 Walnut Street, Brookline, Mass.

'97

This month there is some news of '97, but not good. We have lost **Louis J. Richards** of Course XI and **Proctor L. Dougherty** of Course VI. The former I knew only slightly, the latter I knew well, lunching with him a number of times in Washington. He was a Class Day Marshall and was very active in helping Arthur Jennings some twelve or so years ago. The *Washington Post* of October 17th commented on Proctor's career as follows: ". . . Mr. Dougherty was appointed to the Board of Commissioners by President Coolidge in 1926 and served as its president until 1930. . . . In 1900 he came to Washington to be an electrical engineer with the District government's supervising architect's office and later worked with Otis Elevator Company. . . . From 1943 until his retirement in 1958 he was a consulting engineer for a number of companies, representing them before the District government. . . . Mr. Dougherty was one of the founding members of the University Club here and later served as its president and a member of its Board of Governors. He belonged to the Chevy Chase Association, the Rotary Club, the Board of Trade, the Chamber of Commerce and the Citizens Joint Committee For National Representation." —**George R. Wadleigh**, Secretary, 70 Flower Avenue, Hastings-on-Hudson, N.Y.

'99

Charles S. Gaskill was born on October 11, 1877, in Mount Holly, N.J. and died October 26, 1965. He was president of the class of 1898 at Princeton, then was in Course II, M.I.T. '99. From 1899 he was an executive officer of the Penn. R.R. until in 1917 he received a leave of absence to enter the U.S. army with the rank of major of engineers. He served to August 19, 1919, when he was discharged with the rank of lieutenant colonel of the transportation corps which covered all fa-

cilities in France after the Armistice. He became advisor to the minister of transport in Poland until his return to the U.S. in 1921. In October 1931 he went to Russia with the American Relief Association for eight months in charge of traffic from Poland to the Black Sea. While in charge of Saratov district he fed the wild horses in Volga, Tartara and Kirghis. In July 1922 the U.S. awarded him the Distinguished Medal of the U.S. Order of Palms as officer of public relations in France for rare executive ability and engineering qualities of the highest order. He then returned to his position with the Penn. R.R., was a member of the Baptist Church and the Union League Club of Philadelphia. He married Eleanor Peyton Lapham on January 1, 1908. Princeton, M.I.T., and his family are proud of this outstanding representative of the American tradition of unselfish service for the welfare of mankind. —**Percy W. Witherell**, Secretary, 1162 West St., Wrentham, Mass.

Happy Birthday

In January of this year one alumnus will reach his 95th year, one his 90th, ten their 85th, and fifteen their 80th.

January, 1872—**GEORGE E. HARKNESS**, '96, on the 15th.

January, 1877—**PERCY W. WITHERELL**, '99, on the 8th.

January, 1882—**RICHARD M. LAWTON**, '03, on the 1st; **MRS. E. K. BURDETTE**, '04, on the 4th; **EARL G. CHRISTY**, '06, on the 5th; **FRANCIS J. CARTY**, '04, on the 10th; **MAURICE W. CARTY**, '04, on the 10th; **HAROLD L. NORTON**, '03, on the 15th; **GEORGE A. GRIFFIN**, '07, on the 18th; **ALBERT C. FERRY**, '04, on the 24th; **J. HOWARD PEW**, '03, on the 27th; **KIRK W. DYER**, '07, on the 31st.

January, 1887—**MARCEL DESLOGE**, '12 on the 1st; **ELMO A. ROBINSON**, '09, on the 1st; **LUIS R. GONZALEZ**, '12, on the 2nd; **FRANK S. MCCLINTOCK**, '09, on the 3d; **HAROLD E. MCPHEE**, '08, on the 6th; **PAUL S. HOPKINS**, '10, on the 7th; **ARTHUR R. KNIPP**, '09, on the 8th; **CLIFFORD L. HUFFSMITH**, '11, on the 9th; **GEORGE S. THOMAS**, '10, on the 12th; **WARNER H. KIEFABER**, '08, on the 17th; **EDGAR C. SAVAGE**, '11, on the 20th; **BERTRAND F. BRANN**, '12, on the 23d; **GEORGE R. LORD**, '10, on the 29th; **GEORGE C. CONNER**, '10, on the 31st; **CHARLES W. NITSCHKE**, '11, on the 31st.

'00

Paul Leon Price died September 22, 1966, at the home of his daughter, Mrs. Floyd Allen, in Cooperstown, N.Y., at the age of 90 years. He was born on March 14, 1876, in Colfax, Iowa. He graduated from Simpson College, Indianola, Iowa, and joined us at M.I.T. in our second year. After graduation in 1900 from the course in architecture, he returned to M.I.T. for a graduate year and received his M.S. degree. He then was associated with the American Bridge Company and in 1909 became chief engineer for George B. Post

& Sons, Architects, in New York. Later he was with Irving Iron Works of Long Island City for over 20 years, being general manager and treasurer and then vice-president and chief engineer in charge of research and development. He then was with the George A. Just Company until 1936. The next year he joined the staff of the American Institute of Steel Construction as assistant to the executive vice-president. He edited the Cost Manual and became director of cost and finance in 1940 and controller in 1947, retiring in 1960 at the age of 84. He had lived in Mt. Vernon, N.Y., for 40 years and was a member of the Cooperstown Methodist Church and the Methodist Brotherhood and was a member of Hiawatha Lodge, F & AM, Royal Arch and the Knights Temple. He was a member of the American Society of Civil Engineers, the VanGorx Men's Glee Club and the Mt. Vernon Choral Society. Paul's wife, Roxie, who often attended our reunions with him, died in 1958. He is survived by a son, Harold Price, of Covington, Ind., a daughter Mrs. Eleanor Allen of Cooperstown, N.Y., seven grandchildren and 14 great grandchildren. —**Elbert G. Allen**, Secretary, 11 Richfield Road, West Newton, Mass.

'01

The principal 1901 class news concerns more members who have passed on. **S. W. St. Clair** died on June 2. He was well-known in architectural circles and was president of the Sturgis Associates until he retired in 1960. . . . **William T. Aldrich**, IV, S.B., passed away on June 2. He was a prominent member of the class and will be missed. . . . **Edward P. Beckwith**, V, S.B., died on July 5. . . . **Lyman H. Bigelow**, I, S.B., died in Hawaii on June 19. He was a valuable member and attended several reunions. . . . **Leonard D. Chandler**, II, S.B., died on January 24, 1966. He was connected for many years with the Abington Bank, finally as president. . . . **Roland E. Simonds** died on June 7, 1966. —**Theodore H. Taft**, Secretary, 34 Lawrence Street, Jaffrey, N.H.

'03

Can computers help editors in a seemingly endless scope of endeavor? American Newspaper Publishers and M.I.T. announce establishment of a newspaper research project at M.I.T. designed "to investigate experimentally how some of the recent advances in information transfer engineering can be applied in the newspaper business." The project will be carried on at M.I.T. in close association with Project Intrex, a larger program of information transfer experiments—under the direction of Dr. Carl F. J. Overhage, who also serves as one of three members of an ANPA Scientific Advisory Committee. The effort sponsored by ANPA will initially be aimed toward computer aided procedures in editing and information

management. It will be under the technical direction of William B. Kehl, who has been appointed Associate Professor of Electrical Engineering and Associate Director of the Computation Center at M.I.T. "Developed by M.I.T. as an experimental approach toward the evolution of a large university library into a new information transfer system, that could become operational in the decade beginning in 1970," the work was described by Charles H. Stevens, a project staff member and chairman-elect of the Association. . . . New aids for the blind have been under study at M.I.T. It visions the blind to read aloud from books, magazines, newspapers and other printed material as a possibility. Computers may enable an ordinary typist to turn printed material into braille quickly, through a diverse and growing technical interest in sensory aids. The research activities are supported by grants from the vocational Rehabilitation and Health Institute. . . . The office of Congressman Thomas P. O'Neill, Jr., announced recently that the Navy Department has allotted \$7.4 million to M.I.T. for use in designing development and testing of the Poseidon missile guidance system. All work on the project will be done at Cambridge, Mass. . . . Too little publicity is given to the lighter side of M.I.T. student life, as in their well-organized and popular athletic and sports schedule. The student enthusiasts of sailing, particularly of the M.I.T. Department of Naval Architecture and Marine Engineering, were recently treated to a symposium on the technical state of the art, with research on its future progress. This took place at Kresge Auditorium. The symposium was moderated by William A. Baker, Curator of the Hart Nautical Museum at M.I.T. and author of several books on historical ships. He designed the Mayflower II, the full-sized replica of the famous Pilgrims' ship which is now docked at Plymouth, Mass. . . . **Leroy L. Hunter**, I, of Chicago, Ill., has joined our deceased members. . . . **George B. Bradshaw**, X, former President of the Vulcan Chemical Company, has now retired—new address, Altamount Apts., Highland Ave., Birmingham, Ala. . . . **William C. Lounsbury**, VII, has a new address, Cedar Crest, 1700 So. River Road, Janesville, Wis. . . . **Adolf E. Place**, I, is still on the active list—531 Avenue "L", Boulder City, Nev.—**John J. A. Nolan**, Secretary, 13 Linden Ave., Somerville, Mass.; **Augustus H. Eutis**, Treasurer, 131 State St., Boston, Mass.

some of our classmates will leave soon on winter trips and when they return report news for our next issue. . . . We have four deaths to report, but no details accompanied the notices. They are **Lewis Newell** of Bradenton, Fla., **Harry G. Chapin** of Fort Myers, Fla., and **Roland Ballou** of Providence, R.I.—**Eugene H. Russell, Jr.**, Acting Secretary, 82 Stevens Road, Needham, Mass.

'05

As we start the year 1967 we can hope for a lot of "happier news" during the next twelve months. However, if you have read the November and December class news, you have heard from a large majority of the '05 men now living, and just hearing from them means that there's a lot of life and spirit in 1905. . . . Continuing the "Chronicles of '05ers" we have this note from **Harry Kendall**, VI, of Portland, Ore.: "We are very glad to know that you and Ruth are well and happy, and I'm pleased to be able to report that we are the same. As to what we have been doing since our last communication, I can say nothing very exciting but nevertheless enjoyable. We bought an attractive little place on the Oregon Beach, 80 miles from Portland by way of the Sunset Highway, a beautiful and easy hour and a half drive from our home here. We have had the place for just three years and enjoy it more as time goes on; drive down almost every week-end except during the winter months which we still spend in Hawaii. Kathryne varied the routine last October by joining a tour under the auspices of the Brooklyn Museum. It was a very interesting and beautiful trip through Greece and a week's cruise on the Aegean Sea with stops at various islands and along the west coast of Turkey. I thought of attending our 60th reunion last year but decided to wait for the 70th. We may go to Montreal next June, and if we do we shall visit my brother at Duxbury, Mass. As for grandchildren, none of my six is yet married. They all live here in Portland, but all three granddaughters are at college in California, one at Stanford, one at Pitzer and one at Scripps." We hope Harry sticks to his plan to visit his brother in Duxbury next June, for then he will probably join in on Alumni Day. . . . **John Damon**, VI, of Closter, N.J., after a few appreciated remarks concerning your Secretary says: "Your appeal for news was persuasive so a search started. With weak initiative and slow movement the weeks have slipped by with very little results. The M.I.T. Alumni Register 1961 only lists six of our class living in N.J. Four Course VI Electrical are: **Harry Charlesworth**, Damon, **Frederick Poole**, **George Rhodes**, all retired and only Poole drives his automobile. . . . Poole was the strong man of the class in the gym tests and I believe got a Douglas Medal. This was the first class to which these medals were awarded. He seems to be going strong still; at least he has it over the other three of us in N.J. Rhodes was the inventor not long after he left the electrical engineering lab. of

"Kathodic Protection" of underground and submerged structures from corrosion. Although the basic patent must have run out nearly 40 years ago, I have reason to remember it for a physically handicapped man working with M. C. Miller, Inc., manufacturing and maintaining the very fine portable instruments necessary for applying Kathodic Protection efficiently, is now living with us." I appreciate John's effort all the more as he is still "slowly recuperating" from the effects of his voluntary efforts for Uncle Sam in Korea during the war. John's son, whom he lives with, another martyr, is "spending a busy life training the handicapped to get back into industry." . . . **Ted Steel**, VI, because of a near total loss of eyesight depends upon his wife, Edith, to take care of his '05 correspondence, and she has been very faithful in keeping me posted. She reports: "Edward has been wonderful, patient and helpful. I was too sick to care much, but it was a hard summer for him. Our son (M.I.T. '38) and his wife are just back from a week-end at M.I.T." I had failed to record on my file card that they had an M.I.T. son. . . . **Warren Wells**, III, also has a wife (Hazel) who pinch-hits for him in the correspondence line: "Sorry—Mr. McLean's letter about the Fund has been mislaid. The Happy Birthday column makes mention of the special 5-year birthdays, so you may be interested to note that A. Warren Wells, 1905, III, will celebrate his 85th on June 3, 1966. Sorry we cannot be in Cambridge. This 'secretary' (of 25 years) is also the driver and it's a long way!" We certainly can assume from this that they are well and kicking-well considering. . . . **Harry Charlesworth**, VI, usually drives or is driven up from his farm in Newbury, Mass., each summer, but his letter isn't too convincing. He reports as follows: "Spent all of July and half of August at the farm. My oldest son who is manager of the Western Electric plant in Oklahoma City was at his camp in Maine for his vacation, so saw much of him. My shallow well gave out with continued dry weather, so had to provide a deep one (140 ft.). That kept me busy so did not get up your way, but look forward to doing so on a return trip." Harry's experience in "having to provide a deep well" is unfortunately too common hereabouts. However, we have had an excess of rain in this particular area (ours) and the lakes are nearly back to their original levels after several years of hoping. . . . **George Prentiss** story is short but indicates that he and his wife are in pretty good shape—considering. He says so: "Glad to know you are 'hale and hearty.' We are 'hearty', but I'm not sure about 'hale' which the dictionary defines 'robustly healthy', being a bit less agile than heretofore and more inclined to watch television than exercise. I find I can't compete too actively nor 'robustly'." . . . This about completes the "Chronicles" except for very brief excerpts. **Fred Abbott**, VI, spends much of his time with his son at 306 Meadows Apartments, Brockport, N.Y. 14420. You hear from **Bob McLean**, Class Agent, in a friendly and fiscal tone. Bob is doing a grand job, and I hope you can and will help him

'04

Election day is over and we can now settle down for another two years. The state in which you made your home for four years elected Republicans for the top places on the ticket. Quite a sweep. . . . **George Kaiser** and his daughter visited Boston in October for his annual visit. I had a very pleasant conversation with him. As these notes will not appear until the January issue let me now take this opportunity to wish you a happy, healthy, and prosperous New Year. . . . Perhaps

keep high the class reputation in percentage of givers. The latest report from alumni headquarters states that the classes having the highest percentage of "givers" were 1905 and 1911. Three cheers for Bob! . . . Alice and **Bill Spalding** are well and happy. Bill reports a double F in gardening, for he plants pole beans and raises morning glories. Keep trying Bill; maybe you'll be an octogenarian Burbank. . . . Mildred Stevenson, Harry's widow, called me up just before Alumni Day 1966 and asked whether I could give her any detail regarding a memorial service for M.I.T. alumni, which was mentioned in the Review as an event in the Alumni Day program. I hadn't heard of it, but looked it up and got the details from Cambridge. I did not see her on Alumni Day but was told that she attended the service. For your information, the Alumni Association has printed a very fine 12-page brochure giving the program and the names of M.I.T. men who had died between June 1, 1965, and June 1, 1966. On that list were the names of 13 1905 men. I am mentioning this with the thought that some will want to include this in 1967. Thanks to Mildred for calling it to my attention. She was always one of the most devoted 1905 wives, attended most reunions and Alumni Days. . . . In the November issue I mentioned that in my obituary of **Jack Flynn**, I was leaving for another time a two-page typewritten story of an eulogy made at Jack's interment. Written in Spanish, I had given it to two lady friends here, who were studying at Belknap College, for interpretation. They returned it after three months with the statement that there were many superlatives and grandiosos, etc. which they could not find in any Spanish dictionary. Let's leave it there. Jack was superlative-period. . . . On October 11 at 3 p.m. our phone rang. October 12 is Sandwich Fair Day—the Little World's Fair—a one day fair where 13,000 (1966 figure) people paid admissions, kids free. I went to the phone and said, "Hi Dean." Dean said "hello." This is not a boost for E.S.P. Each year on the afternoon of the day before Sandwich Fair Day the **Dean Klahr**'s of Erie, Pa., show up here on the way to or from their old familiar haunts in Whitefield, N.H. I just guessed it was time for "CD". He and Helen were feeling fine, although Helen had been recuperating for five painful months from a seemingly (at first) minor accident to her ankle.—**Fred W. Goldthwait**, Secretary, Center Sandwich, N.H.; **Gilbert S. Tower**, Assistant Secretary, Cohasset, Mass.

'06

The state of Arizona has long been noted for its mines, and last April a couple of Tech miners made the headlines—even had their pictures in the paper—the *Arizona Republic* of Phoenix. The occasion was an award of its Legion of Honor by the American Institute of Mining, Metallurgical and Petroleum Engineers. The citation was in recognition of the 50 years continuous membership of **Charles Francis Willis**, III, and the award was pre-

sented to him by **Guy Hall Ruggles, III**. Charles went to Cooney, N.M., as soon as he received his sheepskin in Huntington Hall in June 1906. In 1912 he became professor of mining and metallurgy at the University of Arizona in Tucson and also the director of the state Bureau of Mines. Around 1918 he was in Bisbee as consulting supervisor for industrial relations for the Phelps Dodge Corporation. In 1920 Charles began his long career as the editor and publisher of the *Mining Journal* in Phoenix. He sold the *Journal* in 1946 but "meanwhile had organized the small mine association and created Pay Dirt as its mouthpiece." It was in 1938 that he organized the Small Mine Operators Association and has always been its secretary. Also through the years he "has held a dozen positions on mining and state boards and agencies. He holds Arizona Mining Engineer Registration No. 8, the first registration issued by the State Board of Technical Registration." . . . Guy Ruggles is himself a member of the Legion, being a past officer of the Maricopa subsection of the Institute. Unlike Charles, Guy stuck to mining all through his long professional career. He retired on January 1, 1959. Most of his connections were with copper mines at various locations in Arizona—Morenci, Clifton, Miami, although for two short periods he was just over the border in Mexico. That urge to move around still persists for Guy likes to see his friends, and does, whether its West Coast or East Coast. To attend our 60th reunion he flew across Canada—I had a note in June from New Brunswick—and then flew to LaGuardia for a couple days in the New York area. He had lunch with another miner, **Herbert L. (Wee) Williams** and his wife Clarice who have been living on Long Island since Wee retired in 1957. Guy's next flight was to Halifax, Va., for a visit with his daughter and then to Sharon, Pa., to spend a week with his son Guy, Jr., who drove him to Cleveland (airline strike) whence he flew to Dallas then to Denver and home to Phoenix. You do sure get around Guy! . . . In the December notes I asked for a prompt card from those who go south for the winter, giving me their new address. **George Guernsey**, VI, did just that, though I suspect that he is in Sarasota permanently as he has an apartment in a 25 story "home for the elderly." He said it will ultimately have 3-story east and west wings and total 350 apartments, large dining room with excellent meals, 30 bed well-equipped infirmary, lawn bowling, putting green, shuffle board, and of course the inevitable swimming pool, heated. Being on the 7th floor George has "a marvelous view of the entire shore line of Sarasota and the bay, with Bird Key in between and connected by two bridges. It is especially brilliant at night with the lights flickering from traffic on shore and bridges. Altogether it makes a very enjoyable place to live—air conditioned throughout with individual control." I might suspect that George was selling space, but he didn't say whether it is a co-op, or a condominium, or just rental. It certainly sounds inviting. George's address is 715 Plymouth Harbor, 700

John Ringling Blvd., Sarasota, Fla. 33577. . . . Among the many winter residents of Florida are Mary and **John T. Wrinkle**, IV, who have been going to Daytona Beach since his retirement. John wrote to me before reunion and said, "I regret not being able to attend our 60th anniversary. I had hoped to be present myself. Instead I'm enclosing a snapshot of me and my wife taken last February in Daytona Beach. . . . If you are interested in statistics, we have two married sons and two married daughters and twenty-four grandchildren ranging in age from fourteen months to eighteen years. I find the Technology Review always of interest." . . . We had a brief note late in October from **V.P. Stew Coey**, "Betty and I spent three happy months on Squirrel Island and are now back in our winter quarters." That would be Wilmington, Vt. About the same time I found a full length two-column article in the *Boston Herald* headed "Wellesley Bests M.I.T. in Honey of a Race. The rowing race was unofficial, but the views of the crews were superb. On Lake Waban a Wellesley crew rowed against an M.I.T. crew and clobbered it—the M.I.T. crew was girls too." True to tradition the Wellesley crew dunked its coxswain.

Among the deaths recently reported is that of **William Pitt Bearce**, I, on November 28, 1963, who was with us only one or two years. He was with Boston Edison around 1913 but soon moved to Foxboro and I believe was employed by the Foxboro Company for several years. . . . **Howard Lyford Marsh** died February 5, 1966. He was with us only the first year and in 1915 was manager of the yarn department of a New York company, later sales manager and then a director of Calloway Mills. He had retired by 1941 to Wareham, Mass. . . . **Robert Wyndham Seyms**, I, S.B., died in July 1964, probably in San Francisco where he had lived since 1918 as a sales representative, I believe, for several steel companies. . . . **John Alexander Shepherd**, III, died on October 17, 1964, probably in Dorchester, Mass., where he had been living in retirement for ten years or more. He was with us only freshman year but soon got a job with the City of New York Board of Water Supply. He has had a Dorchester address for over forty years and was with the Massachusetts department of Public Works for a time.—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

'07

Maurice H. Pease, VI, reports he will be at his winter address at Seagate, Naples, Fla., 33940, until spring. . . . **E. Sykes Goodwin**, IV, has moved from Ludlow, Vt., to 703 Mabbitti Street, Kissimmee, Fla., 32741, as reported by the Alumni Register. . . . A note from Miss Barbara Kabot, secretary to **J. M. Barker**, I, tells me that he and Mrs. Barker are spending the October hunting season at their Wisconsin farm. . . . Your Secretary regrets that he was unable to attend the Inau-

guration of our new M.I.T. President, Howard W. Johnson, on October 7 in Rockwell Cage. I understand it was a most successful and colorful occasion. . . . Late in October I received notice from the Alumni Register of the death of **Harry E. Fisher, II**, in Los Angles, Calif., on August 23, 1966. Very little was known about him except that he was employed in the creation of ornamental iron work. I wrote a letter of sympathy to Mrs. Fisher and received a most courteous reply along with an obituary notice from which I quote: "Harry E. Fisher, 82, a pioneer manufacturer of ornamental iron works and a one-time historical researcher for the movie industry, died August 23 at a Glendale Hospital. Death was caused by a gastric hemorrhage. An early interest in both ornamental and tool design led him to the vice-presidency of the Chandler Machine Company of Massachusetts, whose most successful inventions here and abroad were the design and manufacture of the first planers for use on steel and the first machine plaiters for accordion pleats. Mr. Fisher moved to Los Angeles in 1919 where he became a leading manufacturer of ornamental iron work ranging from chandeliers to facades on commercial buildings. He designed, built, and installed the ornamental gates on the estate of the famed singer Madame Galli-Curci. Soon after settling in California, he and his father-in-law, George J. Burns, formed an extensive research library which furnished data to the expanding movie industry whose early studios had no research departments of their own. Costume, ethnological and historical data were supplied to scenario writers such as Frances Marion, to Disney cartoons, DeMille epics, Valentino and Fairbanks sets, and other early "greats." When illness forced his retirement several years ago, Mr. Fisher had again turned to steel as a designer and estimator in Pasadena. He was a World War I veteran. He is survived by his wife, a married son who is a doctor in Mission San Jose, and a married daughter. There are seven grandchildren and two small Korean orphan girls recently adopted by his son." . . .

Don Robbins, our Class Agent, sent to each of us in October his fall letter in reference to the Alumni Fund. Each of us can give something—at least \$5.00, which brings the Technology Review for a year with its monthly news of '67 for our information. Any gift, no matter how small, is appreciated. Make your gift in proportion to your income, but give and give now.—**Philip B. Walker**, Secretary and Treasurer, 18 Summit Street, Whitinsville, Mass.; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass.

cate commemorating his fifty-fifth year of membership. . . . We are sorry to report the deaths of **Alfred R. Hunter**, West Hartford, Conn., April 30, 1966; **Harry L. Burgess**, Jenkintown, Pa., on August 20, 1966; and **Ira G. Hersey**, Braintree, Mass., on November 8, 1966.—**H. Leston Carter**, Secretary, 14 Roslyn Road, Waban, Mass. 02168; **Joseph W. Wattles**, Treasurer, 26 Bullard Rd., Weston, Mass. 02193

'10

News from classmates has been very meager for the last two months. The only ones I have been able to contact are **Ralph Horne** and **Hal Manson**. Ralph doesn't look his age, in fact he is the youngest looking man for his age that I know. He and his wife greeted me while I was at luncheon. I received notice of the deaths of the following: **John H. Ruckman**, Rehoboth Beach, Del.; **James A. Grant**, Bloomington, Ind.; and **Rodney Wheeler**, Stratford, Conn.—**Herbert A. Cleverdon**, Secretary, 120 Tremont Street, Boston, Mass.

'11

I wish to abjectly apologize for a mistake I made in last month's notes. Roy D. Van Alstine did not die last September as I reported, but is still living in California.

The regular November luncheon for classmates in the vicinity of Boston was held at the Faculty Club November 7, with the following present: Gertrude and **O. W. Stewart**, Rica and **Moeris Omansky**, **John Herlihy**, **Roy MacPherson**, **Suren Stevens** and Alma and I. Roy, who is to have a cataract removed from his other eye in a few weeks, told of his activities in the U.S. Veterans Hospital in West Roxbury. He has helped the boys fit up a powerful radio station from which they have received confirmed communications from over 70 countries. He has interested another group in meteorology, and they make weather forecasts with small side bets on their accuracy. . . . O. W. Stewart, who has recovered nicely from three serious operations that he underwent about a year ago, told of a trip he and Gertrude took the past summer through Ireland, Scotland, England and Wales. They particularly enjoyed a number of conducted bus tours. . . . John Herlihy is keeping house alone following the death of his wife, Mabel, in October. All those who have attended our five-year reunions remember Mabel with pleasure as the fine and helpful lady that she was. Our sympathy goes to John. . . . Suren, who has worked in the Boston City Hospital for a number of years, was eased out of his job last summer when his immediate superior died and his replacement wanted a friend in Suren's place. Suren is about to start in a new position for a consultant engineering firm for the Massachusetts Department of Public Works. . . . **Ralph Runels** dislikes the mural in

the lobby of the new John F. Kennedy Federal Office Building in Boston so much that he wrote a critical letter to the editor which the *Boston Herald* published on October 25. . . . **Ed Vose** and **Victor Klapacs** were unable to attend the lunch because of ill health, but sent their regards to all. . . . **Maurice Lowenberg**'s wife, Sarah, was in a hospital for an operation on her knee but expected to be home soon. . . . **Helen and Marshall Comstock** missed the lunch because they were just back from five months at their place in Maine where they had a wonderful time and enjoyed their vegetable garden very much. . . . **Aleck Yereance** and Margaret and **Robert Morse** were unable to attend as they had just left their summer places on Cape Cod for their winter homes. . . . **D. Hugh Darden**, Institute Estate Secretary, included the following in a letter to me about Professor **Harold E. Babbitt**: "Professor Babbitt after many years of teaching engineering at the University of Illinois has retired, and he and Mrs. Babbitt now live in Seattle. During the current year Professor Babbitt is commuting across the continent and teaching at the University of Delaware. Somehow I suspect this situation is a record not only for the class of 1911 but for almost any member of any other class."

I have three changes of address to note: **D. P. Gaillard**, 624 Transportation Bldg., Washington, D. C. 20006; **Ralph S. Pease**, 127 Main St., Medway, Mass. 02053; and **Elisha N. Fales**, 2122 Mass. Ave. NW, Washington, D. C. 20008. . . . It is my sad duty to report four deaths: **James A. Gannon** on April 28, 1965; **Burgess Darrow** on September 10, 1966; **Arthur C. Pillsbury** on September 13, 1966; and **Roy D. Van Alstine** September 16. . . . We are indebted to O. W. Stewart, who was **Carl Richmond**'s closest friend, for the following: "With the passing of Carl Richmond, on November 6, the class of 1911 has lost another active, devoted member, and his home town of Winchester is much the poorer. Carl was born in Revere and attended public schools there. After graduating with 1911 in civil engineering, he served with the Highway Department of Massachusetts, following which he became the first City Engineer of Revere. About that same time he served for several years on the Revere School Committee. He was in France during the First World War as captain in the Corps of Engineers. Subsequently he joined the engineering division of the Associated Factory Mutual Insurance Companies as an industrial fire protection engineer, then transferred to the Arkwright and Boston Mutual Fire Insurance Companies in industrial underwriting work. At the outbreak of World War II he became attached to the office of the Provost Marshal General of the War Department, serving for five years and retiring as a colonel. During this period he was also a member of the Secretary of War's Advisory Committee for Plant Security and supervised the protective facilities of several thousand plants engaged in war work. In Winchester Carl served on the Red Cross Chapter Board and was for several years a Town Meeting

'08

At the May 18, 1966, meeting of the metropolitan section of the American Society of Mechanical Engineers, held at the Engineers Club of New York, **Joseph Pope** received the ASME gold pin on the occasion of his fiftieth year of membership on the Society, and **Les Loeb** a certifi-

member. He also served as Deacon of the Congregational Church in that town. One of Carl's great interests was that of color photography. He had made a large and beautiful collection of slides of New England churches and stained glass windows. He is survived by his wife Helen and four sons."—**Oberlin S. Clark**, Secretary, 50 Leonard Rd., North Weymouth, Mass. 02191

'12

Word has just been received of the death of Colonel **Francis Fuller**, October 10, at his home at 288 Main Street, Orono, Maine. For many years Col. Fuller had been at the University of Maine in charge of military training. . . . **William Boyle** passed away on August 19th at his home, 1608 DeWitt Street, Alexandria, Va. . . . **H. Malcolm Priest** of 5700 Bunker Hill Street, Highland House, Apartment 1004, Pittsburgh, Pa., passed away on August 27th. At the time of his retirement Mr. Priest was manager of the Bureau of Railroad Research of the U.S. Steel Corporation. He was a designer of corrosion resistant steel and lightweight steel for railroad rolling stock. He was the author of a book on welding steel structures and of a design manual for high strength steel. Early in his career with the American Bridge Company he worked on the design of the Chrysler Building and the Radio City Music Hall in New York City. After retiring he was consultant for the U.S. Steel and the Pullman Standard Companies. During World War I he was a civilian employee of the government working at the Dayton Air Field on the design of planes. . . . Mrs. Jerome C. Hunsaker passed away at their summer home, the Ausable Club in northern New York, in the late summer. She was very active in civil affairs on Beacon Hill and a member of the Chilton Club of Boston and Cosmopolitan Club of New York. . . . A note from Dr. **Wallace Murray** tells of the sudden death of his wife on August 11th after an illness of less than two weeks. They had just returned from a trip to the Pacific Northwest, Glacier, Rainer and Banff National Parks. Wallace is living at 100 Memorial Drive, Apartment 5-6A, Cambridge, Mass.—**Frederick J. Shepard, Jr.**, Secretary, 31 Chestnut Street, Boston, Mass. 01945; **John Noyes**, Assistant Secretary, 3326 Shorecrest Drive, Dallas, Texas, 10145

'13

Thus starts a new calendar year. We hope that you all are as pleased with the results of our national election as we are. We elected a Republican governor, lieutenant-governor, Republican United States senator, a Republican state attorney general, as well as a Republican state senator. The Capen family was in the midst of the campaign and will continue working for good government for the next two years. Good news, our youngest daughter Lois, or Mrs. Frank W. Smith, yesterday pre-

sented us with a granddaughter, Amy Capen Smith. Frank W. Smith received his doctorate at M.I.T. in 1949. The *Review* office Class Notes Editor, Mrs. Freda Rich, has notified us that there will be a new corps of Correspondents reporting under the heading of graduate students, which will be reported by courses. Again we shall give you some of the biographical notes of our classmates. **J. Warren Lovell**'s only comment or mark on his returned questionnaire is a check on question (a) thus choosing Oyster Harbors Club as the site of our 55th Reunion. . . . **Edward E. Jewett**, 9 Doty Avenue, Danvers; wife: Bernice R. (Atwood) Jewett; children: Milldred S. Moulton, 39 years, Simmons College 1948; grandchildren: granddaughter Linda A. Moulton, 11 years; "retired 1956 from American Sugar Company; hobby: enjoying life, living on the shore of an inlet to Salem Harbor." . . . **Joseph M. Isenberg** is still in good standing, although furnished no information.

. . . **Scott W. Orr**, Simpson's Point, Brunswick, Maine 04011, is also brief, "Retired." . . . **John H. Hession**, 228 Slade Street, Belmont, Mass. 02178; wife: Anne Splane Hession. He has one daughter, Anne Hession McGiven, and six grandchildren, Bobby, 17; Frances, 16; Anne, 15; Sharon, 13; Michelle, 10; Mark, 8. He is president of the Natgum Corporation, Boston; Western Water-Proofing Company, Inc.; Federal Flooring Corporation; and several others. . . . **Geoffrey M. Rollason**, 935 Belvidere Ave., Plainfield, N.J. 07060; wife: Marguerite Gilchrist; retired since 1954—no longer able to take long trips. . . . **Gilbert R. Pardey**, 548 Sagamore Ave., Teaneck, N.J. 07666; wife: Florette B.; two children, Elizabeth 43, Jean 39; grandchildren: Ann, 11, Andy, 7, Laura, 5, with the surname, Fox; retired in 1955, living quietly with wife who is not too well, personally in good health, though somewhat slowed down with game leg. . . . **Halsey B. Horner**, 34 Greenwood Road, Wellesley, Mass. 02181; wife: Edith R. Horner; children: William R., Charles E. Horner, Jean H. Politzer; grandchildren: Janice and Ann Horner, David, Stephen, and Erick Politzer; "Hope I can make it when this one rolls around (the 55th) Jack." . . . **Herbert G. Shaw**, 210 Church St., West Haven, Conn. 06516; wife: Leila L. Shaw; "I would not like Cambridge, as I would not want to drive in Boston. I know that you drive in Boston and think nothing of it. You have done this for many years and know your way around, and are accustomed to the traffic. So my vote is for Oyster Harbors Club." We hope that you and your wife are well and active as usual. . . . **Max L. Waterman**, 73 Inwood Road, Bridgeport, Conn. 06604; wife: Bertha (Nickerson) Waterman; one son, Donald Wiltur, 49; three grandchildren: Laura, 14, Paul, 12, Susan, 4; "Retired." . . . **Joseph C. MacKinnon**, 100 Memorial Drive, Cambridge, Mass. 02142; wife: Helen; daughter, 44; son, age 49; grandchildren: granddaughters ages 26, 23, 20 and 18; grandson, age 12; great granddaughters ages 6, 4, 2 and 1 plus great grandsons ages 4 and 1; "Retired from M.I.T." Well! Joe, we think you hold the record in our class for offspring,

covering four generations. . . . **Clarence W. Brett**, 398 Ogdenave, Teaneck, N.J. 07666; wife: Ruth; children: William, 41, Marion, 50 years; grandchildren: Verdi Louise Fleming, 19 years, and Patricia Brett, 14 years; "I retired in 1958 after 45 years with Dodge Mfg. Company. I have been chairman of the Planning Board here in Teaneck for several years (population approximately 45,000). My municipal work included six years as a member of the Board of Education (three years as president) and twelve years as a member of the Township Council (four years as mayor). I have been interested in the Hackensack YMCA for a number of years (four years as president of the Board of Directors, and now serving as a Trustee). We are trying to grow old gracefully, keeping busy enough to keep out of mischief. We wish you and your wife the best of everything. Please say 'Hello' to any of our friends you may meet." What a dedicated life to your community, bravo! . . . **Frederick W. Lane**, 37 E. Lee Street, Bel Air, Md., 21014; wife: Eva Fergus Lane; a son, Fred M. Lane, 34; grandchildren: Sheerie, 7, Fred, Michelle, 1; "Hello Phil, You're right on the job as usual. Our only auto trip this year was a drive to Michigan and Indiana where we renewed acquaintances with Eva's relatives. I am a member of the Baltimore Camera Club, so quite a bit of my time is given to color photography. We are driving to Florida later in the season." . . . **Walter P. Muther**, Route 1, Box 349, Easthampton, Mass. 01027; wife: Marion H.; daughter, Sally Lawton; grandchildren: Edward 12, Cynthia 10, James 6; great grandchildren: "What age? The Stone Age"; "Retired on the farm, raise and freeze vegetables for the winter like the ants, also cider. Besides help preside over a flower garden, play some golf. Come visit. Holding down the homestead while the rest of the family is in Japan for sabbatical. That's all, Walter." . . . **Charles Edison**, the Waldorf-Astoria Towers, 36-A, New York, N.Y. 10022; wife: Carolyn Hawkins (deceased). . . . **Victor Mayper**, 200 Park Avenue, New York, N.Y. 10017; wife: Anne; children: Victor Mayper, Jr., 38; grandchildren: Diana Mayper, 3, Nicholas, 2; activities: consulting engineer; hobbies: traveling. . . . **Warren E. Glancy**, 75 Riverview Ave., Waltham, Mass. 02154; wife: Charlotte Lincoln Glancy; children: Jean Glancy (Mrs. Edward C. Duerner); grandchildren: Ellen, Warren, John and Peter Duerner. "Well! we did drive to the West Coast in late May and returned without a mishap, 47 days away. Good trip. Glad we went to see relations and friends, but doubt if we would do it again." That's it for this month, more in February.—**George Philip Capen**, Secretary and Treasurer, 60 Everett St., Canton, Mass.

'14

Thorn Dickinson tells me that he is back in the big city for the winter, Hotel Woodward, Broadway and 55th Street, New York, N.Y. 10019. To quote Thorn, "I

am back at the old address after my eighth consecutive year at Elk Lake. What with exploring around in the woods and mountains and making trails, am feeling fine." With this recipe we agree, but why stop in the winter? Other changes in address include **Reeves Newson**, Scarsdale Apartments, Garth Road, Scarsdale, N.Y. 10583; **Lyle Richardson**, Old Concord Road, Lincoln, Mass. 01773; **Arthur W. Johnson**, P.O. Box 462, Wolfboro, N.H. 03894; **Roger Williams**, Box 423, Buckingham, Pa. 18912. . . . We haven't had too many of our friends and classmates who have had a peek behind the iron curtain, so **Skip Dawson's** recent note is of special interest. "Dear Herman, For the first time since retirement my domestic management persuaded me to leave the Berkshires in summer, and we embarked on the new Norwegian American Liner Sagafjord in June for the North Cape cruise. My thanks have gone to her ever since as we had never visited any part of the itinerary before and found it interesting, delightful and informative. After a perfect eastward passage, two days in Ireland and a day in the Loch Lomond district of Scotland, we reached Scandinavia at Hammerfest, Norway. We were thrilled by the magnificent scenery of the fjords and the incredible navigation required to explore them to the upper end in this big ship. Then came the big cities, Bergen, Oslo, Copenhagen and Helsinki. One is struck immediately with their cleanliness, beauty, appearance of prosperity and, most of all, their attractive up and coming people. After sailing from Helsinki to Leningrad we entered a very interesting and informative phase of the trip, a two-day stay in Russia. Leningrad, aside from a modern port, the beauties of the old Czarist buildings and a marvelous ballet, was depressing. The streets were bare of private cars, signs of economic activity were scarce and the people looked lackadaisical and unhappy. Moscow was in complete contrast. Streets well-filled with private cars, the finest subway in the world, tremendous construction completed and in process, the immediate area full of modern industrial plants and people active and apparently quite happy. One leaves there with the strong impression that the U.S.S.R. is well over the hump. We left the ship at Lubec, Germany, had a short look at Hamburg and flew to West Berlin which is a real showcase. The interesting thing there is the location of the wall which zig-zags between West and East Berlin, the latter looks drab and dreary but, in an afternoon bus tour of East Berlin we found it more like Moscow than Leningrad. Followed a flight to Munich which is charming, thence to Brussels and Antwerp where we rejoined the ship for the westward crossing. All this in forty-five days, New York to New York. Skip."

We have had good news from **Harold Richmond** whose arms and shoulder are just about all O.K. again. And to sign off, I have a clipping from the *Reader's Digest* contribution solicited column which **Lin Faunce** sent to me recently, the author of which comes from the town in Maine where we get our mail from (or should it be from which we, etc.). "In our

small Maine town we pride ourselves on keeping up with the times. Our supermarket is the chromiest, and most of the farmers have replaced their horses with tractors and station wagons. One of the latter, shiny new, pulled up to the curb near me the other day. As the elderly driver got out the car began to roll. He yanked the door open and set the hand brake. Then, walking around to the front of the car again, he patted the hood fondly and remarked to me, 'She hates to stand'. Our own reaction is a very small element of probability.—**Herman A. Affel**, Secretary, Rome, Maine. Mail: RFD 2, Oakland, Maine 04963

they cannot seem to get rid of me. Of course, I am only a lecturer for five weeks, and not a professor, which makes the difference. For the last couple of years I have been president of the Horticulture Club of Newtown, but relinquish that job on November 10. Maybe you are off to the Caribbean or other exotic ports, using your ill-gotten gains for such hegiras. If so, more power to you and Fran. With all best wishes to you and your better 15/16ths." At long last I have finally come up with what I feel are complete and accurate class statistics. As of November 10, 1966, there are 250 living classmates in the United States and 6 in foreign countries—a total of 256. There are 288 deceased; 48 drop-outs and removed from the list because of no address; 19 removed from the list by request. This makes a grand total of 611 on the original class list and includes everyone ever registered for any class or course over the four years. Another long letter from **Ernie Loveland** in Malaysia tells of his work on eucema in Singapore with an algologist from the University of Hawaii. His most recent experiences seem to have been in more settled and civilized places but still "no man's land" to us. . . . **Louis P. Smithey** died August 18 in Roanoke, Va. . . . **Frank S. Whearty** died November 4 in Salem, Mass. What are you all doing this winter?—**Azel W. Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

'15

Happy New Year with the hope that you and your families have all enjoyed a pleasant and comfortable holiday season. Our annual New York class dinner will be held April 21 at the Chemists' Club. This later date should be more appealing and bring out a big attendance. We'll see you there. After **Larry Bailey** received an award at Hershey, Pa., early in October, he wrote: "My acceptance speech was very well received on Monday evening after a big dinner. I was the last of three recipients of citations. Several said they liked my speech best of the three." The citation, an honor to Larry, read: "The Metal Powder Industries Federation honors Lawrence H. Bailey as a powder metallurgy pioneer in recognition of the significance of his pioneering contributions that have advanced the progress of powder metallurgy from a laboratory technique to a modern industrial technology. October 1966 MPIF." Powder metallurgy is a process whereby metallic parts are pressed to exact shapes and hardened by firing, rather than being made by casting, rolling and machining, greatly reducing the production costs. Larry, while working for the F. J. Stokes Corporation of Philadelphia, designed most of the presses used in the high speed production of self-lubricating bearings, gears, cams, carbide tools, and other mechanical parts, for automobiles, business machines, clocks and dozens of other products. Congratulations, Larry. . . . I am glad to report that **Reggie Foster** is now recuperating at home. The many cards, letters and flowers you fellows sent were a great cheer and help to him. . . . **Hope Holway** sent a belated class dues check for Bill—generous, well-received and many thanks. . . . **Jim Tobey** keeps going and is preparing to suffer through another winter at West Palm. And what a rib he gives me about our hard-earned winter holidays. Ah, me! "Our address in Florida this winter will be different, 309 Conniston Rd., W. Palm Beach, Fla. 33405. It is in the same group of apartments, but fronts on another street. Same landlord and a better place at same high price. If you are down that way, hope to see you all. About the only news is the startling fact that I have been reappointed to the faculty of the Yale School of Medicine for another year. Despite my advanced age, well past the retirement age,

'16

Memories of the colorful fabulous 50th Reunion linger brightly on as we see letter after letter expressing appreciation for the work done in planning and carrying out the exciting four-days program in June—in Cambridge, in Osterville, and again in Cambridge. An 8-page illustrated report of the long-awaited anniversary has gone out to the class telling the absentees just what went on and giving the nonabsentees fresh reminders of such things as commencement exercises, red blazers, Bucentaur christenings and Bucentaur pageantry, really meeting at close hand our retiring beloved President and Mrs. Stratton in the President's garden, golden fleeces and over-sized rented beavers, our own **Van Bush** speaking to us again, gatherings with many first-time-at-a-reunion wives, and last but not least, genuine fellowship at an age when competition is about gone. The report was built up with the help of material furnished by **Steve Brophy**, **Jap Carr**, **Jim Evans**, **Ralph Fletcher**, **Maury Holland**, **Ruth and Emory Kemp**, **Stew Rowlett**, **Peb Stone**, and **Will Wylde**, and was illustrated with the two class reunion pictures and many beautiful snaps of key happenings by **Willard Brown**, official reunion photographer, and **Herb Mendelson**. And we are indebted to **Bob O'Brien**, honorary member and reunion secretary, and **Donn Byrne**, Ralph's secretary, for handling the design, layout, printing, and distribution of the report. Steve Brophy doesn't like to brag, but he just couldn't resist reporting what he heard about the reunion at

the inauguration of President Howard W. Johnson in October. Says Steve: "I saw several members of the class of 1917 including Penn Brooks, and they were lyrical about our 50th Reunion and most appreciative of your offer to help Dix Proctor. Incidentally, among the people who commented on our 50th Anniversary Reunion were President Johnson, Marshall Dalton, president of the class of 1915, and many members of the Corporation." . . . **Frank Holmes** wrote to say how wonderful it was to meet so many of the '16ers at the 50th. He too noted, as **Dick Fellows** did (in the December notes, that of the eight 1916 freshmen from Somerville High, the still-alive five, Messrs. Anderson, Carpenter, Fellows, Holmes, and Pearson, were all at the Oyster Harbors Club at the reunion. The Holmeses plan on driving down to Florida when the cold weather reaches New England. . . . **Art Caldwell** says the class picture at Osterville is "one of the best group pictures I have ever seen. The clarity is remarkable." (Melvin Howard, photographer of Hyannis, please note.)

. . . **Virginia and Joel Connolly** of Tucson have referred to the 50th as the "high point" of 1966, "our thanks to all who made it so outstanding." Joel tells of a "small world" item while he was at the reunion. In October 1965 the Connollys had a "sumptuous dinner as guests of two of our old friends, Mr. and Mrs. Hon-Chu Fung, at the Hong Kong Country Club. On arriving in Cambridge, Joel called their son, Victor, a senior at M.I.T., learned that the parents were to be at the commencement, stood at the rear of the hall after the graduation exercises, and "watched the people leaving until I spied his parents and spoke to them, much to their surprise. Small world, eh?" In late summer Joel had another item in his "small world" collection of experiences. Luching in a small Harwichport restaurant in August, he engaged in conversation with a man who came in and sat at the same table. He turned out to be a high school classmate of Joel's, took Joel to his home, and showed him a high school class picture. "In it we recognized **Raymond B. Blakney**, '16, now in Claremont, Calif., and **Nicholas Balyozian**, '16, whose address we do not now have." And from **Blythe Stason** we have: "The 50th Reunion was a notable event. I treasure the memories and the strikingly good pictures." Then: "I live a rather quiet life without many of those incidents that make news." (Last year he accepted the Frank C. Rand chair of law at Vanderbilt University.) "I am back at Vanderbilt for another year teaching local government law and science and the law, next semester administrative law and legislation. I am really enjoying life for I love teaching and working with students. My wife and I have found a most cordial reception in Nashville. Additionally, we enjoy the comparative freedom from sleet and snow and icy winds. The 'sunny South' has much that is appealing. So, as long as we can stand up straight we shall be Nashvillians." . . . Since returning from their African trip last March, the **Harold Grays** have done little, they say, and the real outstanding event was that

"Marvelous" 50th Reunion in June. Harold goes on: "The rest of the time we have been busy just staying home. I did have a week's trout fishing that was delightful in August. Fished the Chateaugay River, the Big Salmon and the Chazy-Northern Adirondacks. The weather was beautiful and the streams in excellent condition. My waders didn't leak and my Orvis Battenkill rod worked beautifully! I did find that a wading stick was helpful as age does not improve one's reflexes on slippery rock in stream bottoms." . . . **Emerald and Ken Sully** are looking forward to another reunion with the class, as they return from a visit to Ken's sister and husband in Piedmont and San Francisco. . . . And **Henry Shepard** says the summer passed "all too quickly with hiking, swimming and working around our cottage up in Randolph, N.H." Then: "Took part in several tours with the 1913 Chalmers which runs better the more it is used. Am now taking lots of exercise (October) to get hardened down for the curling season which starts next week. Never a dull moment." . . . **Hovey Freedman** is feeling better, he says, having lost 60 pounds by dieting "but darned expensive having suits made smaller." Says he's keeping busy "working in my shop, painting boats, repairing furniture and a thousand other things." . . . **Theron Curtis** says right out what a lot of us have been thinking: "The general situation in the country confuses me. Perhaps the election will point in some new direction. Let's hope so." We feel safe in assuming he now feels better (2 days after election day) and can now take that short stay in Jamaica in February or March. . . . And from **John Fairfield**, concise notes: What doing—"gardening, reading, country viewing." Where been—"northern Vermont and northern N.H." Who've seen or heard—"hear of **Herbert Gfroerer**'s (slow) convalescence." What children, grandchildren doing—"growing older, same as we." Philosophy—"autumn colors are most enjoyable."

Deceased

JOSEPH P. CATLIN, '01, August 23
LEONARD D. CHANDLER, '01, January 24*
ALONZO K. ISHAM, '01, September 15
RICHARD F. SPAMER, '03
CHARLES O. EGERTON, '04, October
FREDERICK E. BURDEN, '05, October 8
EMORY G. HUKILL, '07, May 25
FRED PAUL UPTON, '07, 1965
IRA G. HERSEY, '08, November 8
OSCAR A. IASIGI, '08, May
MRS. ELIZABETH S. MACDONALD, '08, November 30
LEWIS J. HOLLIDAY, '09
W. PHILIP DOERR, '10, October 25
RODNEY WHEELER, '10
ARTHUR E. BRADLEY, '11, June
JAMES A. GANNON, '11, April 28, 1965
CARL G. RICHMOND, '11, November 6*
MRS. ROBERT SPENCER, '11
ROBERT R. LANGE, '12, December 16, 1965
DAVID H. HILLIARD, '13, November
GEORGE C. LAWRENCE, '15, May 16
FRANK S. WHEARTY, '15, November 4
TSUNEZO HADA, '17, January 11
FERNALD E. HULSE, '17, April 25

This fall the **Vert Youngs** went back to Vert's 55th high school reunion in Pittsburgh. While there they stayed in the very hotel, the Webster Hall Hotel, that has been **Spotts McDowell**'s home for some time! And during a semi-shut-in period, Spotts has greatly enjoyed some of the delightful and penetrating Sylvia Young safari letters that your Secretary has had on hand for circulation to '16ers. So, Vert and Sylvia looked up Spotts the first thing. Says Vert: "We had several nice visits with him, and Sylvia was absolutely charmed by the old rascal. He gave me a couple mineral specimens, and altogether we had a wonderful visit." And in turn we have a most enthusiastic letter from Spotts, who says in part: "Since my last note to you I have had the very great pleasure of meeting Vertrees Young and his wife Sylvia. What wonderful people they are! . . . The main purpose of their visit was to attend the 55th Reunion of Mr. Young's class at Pittsburgh Central High School. The celebration was held on October 9th at the University Club. Andy Kerr, formerly football coach at Pittsburgh Central High School, who later achieved fame as coach at Colgate, was the honor guest." And Spotts shares our enthusiasm for Sylvia's writings, as he bubbles: "Sylvia writes very fluently, in the most beautiful English. Her word-pictures are so vivid that it is easy to visualize the objects and the scenery which she describes, and to share in her enjoyment of them. Her very evident love of beauty colors each letter. Walt Binger tells of asking **Joe Barker** whether he would be able to show his slides of the churches replacing those bombed out in World War II, slides Joe had taken on his trip abroad for Trinity Church. Joe had agreed, and Walt indicates that Dr. McCandless, Rector of Epiphany in New York, jumped at the chance of having the slides shown in his church. It took place on October 9th, in the coffee hour. Walt says it was very successful and also "pointed the way for the Trialogue Ser-

LESTER I. BEAL, '18, November 18
JOHN C. JANSON, '18, October 28
GEORGE HALKIOPULOS, '19, March 1965
WILLIAM B. SNOW, '19, October 14
FRANK S. OWEN, '20, October 11
FOSTER M. POST, '21, October 24
ROBERT R. CULBERT, JR., '22, April 3
HAROLD J. PAYNE, '22, November
MAXWELL B. SEDER, '22, October 16
RAYMOND F. PUGSLEY, '23, July 15
JOHN SCHUBER, '23, September 18, 1965
RICHMOND K. KELLY, '24, March
KURT E. LINDQUIST, '25
PHILIP M. HULME, '26, August 1965
WILLIAM P. LOWELL, JR., '26, October 2*
MATHER GARLAND, '27, August 6, 1965
DONALD S. KENNEDY, '28, June 5
JOHN J. KENNEDY, '31, March 29
HUGH E. JONES, '32, November 1965
LELAND L. LEWIS, '33, April 24
WILLIAM R. STUCKEY, '36, February 6
MAURICE B. GORDON, '38, July 25
ROBERT D. MCLEOD, JR., '38, November 11
PAUL E. PELLETIER, '39, January
EVERETT T. SIPSEY, '41, August 1
ANDREW T. ROSKOS, JR., '64, September 3
*Further information in Class News.

mon." . . . Here's something we'll have to show at the next reunion, something that **Francis Stern** has unearthed from way back in our Tech days. It is a picture with this background, as Francis tells it: "Back in either 1913 or 1914, the Institute received its first \$2,500,000 gift. Later on we knew it came from Eastman, but at the time, it was announced as coming from 'Mr. Smith.' Somebody or other drew a picture on the blackboard, I think in one of the engineering buildings. It may possibly have been at Rogers, but I think it was in engineering. Anyway, at the time I was photographer for the *Tech*, and I took a picture of it. I remembered it, and in going through some old files I finally found the plate negative. Yes, it was a plate, for in those days I used a foreign Graflex which didn't use film but plates. I've had a couple of prints made and I enclose one of them and an enlargement. It's a souvenir that will probably interest many of our classmates." . . . In the warm Indian summer weather of late October **Gene Lucas** in Watertown, Conn., kept busy putting his beloved organic garden to bed for the winter, we are told. Gene and Di attended a week's conference in Lasell House, Whitinsville, Mass., the Episcopal conference center of western Massachusetts. Gene taped the conference and the two leaders of the conference from the Harrisburg, Pa., Cathedral stopped off with the Lucases en route. On their Maine to Vermont August tour this year, Gene and Di stopped off for lunch with "Boots", '15, and Helen Malone in Chester, Vt. "Boots" looked wonderful. They have an enchanting old house overlooking beautiful acreage and lovely mountains—we were lucky on the weather for we "could see forever." . . . **Bill Drumrey**, an ingenuous and dependable answerer to our calls for a few lines, writes: "I do not think that you should 'stop the presses' but it is my birthday! Learned M.D.'s tell me there is nothing the matter with me—save an incurable disease, known as 73. An accent to this is that my oldest grandchild is a college freshman this year. The firm Drumrey-Rosane-Anderson, Inc., is very busy and gets along splendidly in my absence. I do note that sometimes if things get a bit sticky, they do call for the old man. We are working on the 88th school I have served since opening in 1923. The more 'little monsters', the more school houses—à bas birth control!" . . . As reported through **Obie Pyle**, the **Mark Aronsons** had planned to be at the 50th but illnesses and hospitalization unfortunately prevented. Formerly living in Philadelphia, they have now settled in Miami Beach where Mark has received a license from the Florida Real Estate Commission. He is now located in the Miami office of the Southland Companies. He says that since moving to Florida he has attended meetings of the local M.I.T. club. The speaker of the last meeting was C. R. Sandlin, '53, Engineering Services Coordinator at the *Miami Herald*. His talk was concerned with "the more exotic applications of computer systems to the graphic arts. This outstanding newspaper has done considerable pioneering work in news-

paper applications of computers in the business and production operations, including composition set-up. In its credit processing applications, and its letter typing and mailing responsibility, the computer has no qualms about notifying Dupont or Standard Oil that its credit was no good. When the computers go haywire, the mistakes they make are usually beauts. No question about it." . . . Reunions serve many purposes, including better interrelationships. Here's an example from **Will Wynde** in Stamford, Vt.: "Ann and I have completed arrangements to go out to Green Valley, Ariz., for the winter, arriving there in early January. We have corresponded with **Joel Connolly** and his wife, who as you know live in Tucson. We became acquainted with them at the Reunion and expect to see them there as soon as we get settled. We intend to stay for 3 or 3½ months." Will comments on the Reunion picture: "I received the reunion pictures—they certainly are wonderful. The one with the red coats is framed and occupies a prominent place in our living room, as I just love to have my friends ask, 'What is this?' Then they get an earful, a very enthusiastic earful!" And it is becoming more and more clear to us that whenever the 50th Reunion is mentioned the descriptive word most commonly used is "wonderful." As a sample take the letter just received from **Rudi Gruber**: "Shortly after our wonderful Reunion at the Cape I left for Europe by Lufthansa, mid-June, to return to the U.S.A. in mid-August. Among other things I attended (for the 6th time) the annual reunion of Noble Prize Laureates in Lindau Bodensee. Since that time have had many interesting and pleasant contacts with my 'sixteeners': frequent luncheon-gatherings at the Chemists' Club, the wonderful Lincoln Center Concert in honor of our new President Johnson, then on October 6 and 7 respectively the M.I.T. Faculty Development Committee Meeting in Cambridge, and the official inauguration of our new president, and also the pleasant October luncheon of the 1916 monthly luncheon group at Walt Binger's in Fairfield, Conn." But Rudi wrote this too soon to report on the delightful October luncheon party of '16ers at Steve and Jessie Brophy's beautiful home, "On the Rocks," on Quaker Hill, Pawling, N.Y. There one can enjoy broad vistas of unspoiled nature and even become a passenger in a real old-fashion'd row boat with Steve himself as oarsman. . . . **Bill Leach** writes from their summer place in Youngstown, N.Y., that he and Helen still have fond memories of the 50—"it was a grand affair." In line with their plan to sell their farm in Youngstown, Bill says Helen "is selling a lot of her antiques since they do not go too well in our house in Austin. Without any advertising buyers have been coming in, many of whom are dealers from all over western New York. Helen would make a splendid antique dealer, but if it ever happened, I would build a small cottage in the rear of the lot." Those who know Bill well, and his football status of 50 years ago, will understand when he writes: "My knee may be getting a wee bit better. Football

is not kind to knees. One thing that might be done is for the ends and quarterbacks to wear sneakers and not spikes. They might slip some, but save some knees. When you plant your foot on the ground with spikes, your foot can't move with the rest of you, and something has to give." . . . For the 9th year **Jap Carr** reports running a fall tennis tournament at Buck Hill Falls, Pa., this one a three-day affair with 108 in attendance. Early in November the Carrs left for their winter in Palm Beach, where Jap is always glad to welcome sojourners, especially the '16 kind. He writes: "For sixteeners who get to Florida, write us at 260 Pendleton Avenue or phone 305-TE3-4312." On a request for some philosophy he replies: "Not my line, but old friends are the best friends, and it was a delight to see so many sixteeners again. The attendance of so many wives must mean we have converted them to our loyalty to M.I.T. and the class of 1916." . . . **Elizabeth Pattee** missed the 50th for it came at the time of a professional 3-weeks trip to Germany at the Congress of the International Federation of Landscape Architects. She writes: "There were delegates from all countries, from Japan and India and back through the countries of the Near East, Europe, Africa, and the Western Hemisphere. The big interest of all was how to conserve and provide permanent open space for the future population growth. Meetings were held in Stuttgart, but we also spent time in Ulm, Konstanz, Frankfurt and Hanover and were shown examples of what the Germans have been doing since the War with recreation, parks, housing and regional planning." Elizabeth is a retired professor of landscape gardening of the Rhode Island School of Design and now lives in Hightstown, N.J. She has been involved in some lectures for New Jersey garden clubs, and has "very pleasant contacts with the new Department of Landscape Architecture at Rutgers." . . . **Maury Holland** waxes eloquent as he contemplates the 50th Reunion class picture of red-blazerites on the M.I.T. steps: "The picture of the 'Grenadier Guards' in their red tunics, standing at attention on the 'barracks steps', looks down upon me from my office wall. There's a wry smile from our most distinguished classmate, Van Bush, in the front row, where the history of science and education will surely place him." Maury is proud to note that two days after the 50th Reunion, "our son Maurice, Jr., graduated from Harvard Law School with a Master's degree in history. He hopes to complete his Ph.D. work this year with a thesis combining history and law." . . . We regret to report the death of **Everett Johnson**'s wife, Kathryne, on October 4 in Monroe, La. Everett writes that she had a 44-day bout with cancer but "she was spared the lingering painful period so common with cancer. Never had any pain and as General MacArthur said, She 'just faded away.'" We of 1916 send our deepest sympathy to Everett. . . . Now of course we look forward to the 51st Reunion to be held at Chatham Bars Inn in Chatham far out on Cape Cod, June 9-11, and Alumni Day in Cambridge June 12. Just keep your little old bits of news and phi-

losophy coming in, to help keep the column full and interesting. And now best wishes from your class officers for a happy, prosperous and healthful New Year.—**Harold F. Dodge**, Secretary, 96 Briarcliff Road, Mountain Lakes, N.J. 07046; **Ralph A. Fletcher**, President, Box 71, West Chelmsford, Mass. 01863; **Joseph W. Barker**, 45 Beechmont Drive, New Rochelle, N.Y. 10804; **Hovey T. Freeman**, 45 Hazard Avenue, Providence, R.I. 02906; and **Steve Brophy**, Reunion Chairman, 470 Park Avenue, New York, N.Y. 10022

'17

If these notes do not meet the deadline it is because of the Gemini launching on November 11th. Your Secretary just had to stop editing and watch the television as Edwin E. Aldrin, Jr., was one of the two astronauts. Incidentally, we have word that his father and our classmate recently attended his first Alma Mater, Clark University at Worcester, Mass. Ed was an honored guest at the time of Vice President Humphrey's visit to the University. . . . Quoting from the M.I.T. Alumni Center of New York Newsletter relative to M.I.T.'s night at the new Philharmonic Hall at Lincoln Center, which was attended by the Lunns and Loengards, "Culture and science combined on Wednesday, October 5th. The occasion was a black-tie cocktail party and special concert by The Festival Orchestra of New York in honor of Mr. and Mrs. Howard Wesley Johnson. Mr. Johnson, 12th President of M.I.T., was inaugurated two days later at formal ceremonies on campus. There was a broad representation of classes from the turn of the century to the class of '66." To those at our 49th Reunion at Sturbridge, Mass., who attended the inauguration at Cambridge we have this comment, "The inauguration was a knock-out, very well done in every way, and there is real enthusiasm for Howard Johnson." . . . **Ray Maeder** had two full bushels of fancy grade special apples ready to take to Sturbridge for the Interim Reunion when Mrs. Maeder found herself unable to go (same happened with your Secretary). They expect to be with us at the Cape in June. Their son returned recently after a year in Vietnam. Major Maeder is now going to Texas for his master's in hospital administration—maybe **Ralph Ross** has a successor coming along. Two other sons live near Boston. . . . On the evening of November 3 there was a small but most interesting dinner party at the New York Tech Club. There was rather an international touch as one was class of '16, who in the year had visited Iceland and Germany three times, then a bit of New England, as class '18 was represented from Plymouth. The following day our roving ambassador and news reporter, par excellence, **Ray Stevens**, wrote as follows: "I did not know what we were celebrating last night until I read the *Times* this morning. I'll enclose the clipping as you may not have seen as full a story as the *Times* gave. It was good to see you and Vi

again and I enjoyed thoroughly meeting with your interesting guests. It was a pleasant surprise after expecting a dull and lonesome evening. Today I go to a meeting in Puerto Rico, prior to a week on the Island later in the month." The *New York Times* article covers the Nobel prize winners for chemistry and physics and for the former, our **Robert S. Mulliken**. Dateline November 3 from Tallahassee, Fla. we quote in part, "At the University of Chicago, where he has been a member of the faculty since 1928, Robert Sanderson Mulliken is known as 'Mr. Molecule.' To the man who has devoted his life to the study of the electron, and the quantum theory, was awarded the Nobel prize for chemistry. He was notified of the \$60,000 award as he and his wife were moving into the house they will occupy here while Dr. Mulliken gives a series of lectures at Florida State University. The 70-year-old scientist does not try to explain the theories on the electronic interaction within the molecule that won the award, at least to laymen. What molecules are doing is just about as complicated as what people are doing he said. Dr. Mulliken was born on June 7th, 1896, at Newburyport, Mass. His father was a professor of organic chemistry at the Massachusetts Institute of Technology. As a child Mr. Mulliken was more interested in nature than molecular theory. He began developing his theories on molecules while he was still in high school, but he says it took quite awhile before anyone took them seriously. Dr. Mulliken was graduated from M.I.T. in 1917 and got his doctorate from the University of Chicago in 1921. During World War II he was a key figure in the development of the atomic bomb, coordinating the work of eight projects doing related work throughout the country. Honors by the bushel have come his way. Since 1956 he has been a Burton Distinguished Service Professor at Chicago; at Florida he is a Distinguished Research Professor of chemical physics. He has honorary doctorates from Columbia University and the University of Stockholm, has received five major awards from the American Chemical Society, and has been a visiting professor at Oxford and the University of Amsterdam. Part of his prize money will be spent on his hobby he says. That is his collection of antique oriental rugs. 'I confess I'd like to be a rug dealer,' he said. 'I buy a few here and there when I get a chance. Last year I bought two or three instead of a new car, but there are not many good ones around.'"

Dick Lyons in a letter dated October 27 says, "Sammie and I hope to attend the 50th Reunion. In a few days I will send you something up to date about our activities." All news items are gratefully received. . . . Our very able treasurer, although somewhat without funds, writes that, "We were in Connecticut for a couple of days not so long ago looking after the Mystic Seaport. Sorry about **Jim Flaherty**—if you know his sister's name and address, I will write him a note." I can report that Jim is reporting well and is receiving mail at 5 Eastern Ave., Dedham, Mass. Loosh further writes, "Both of us are doing well physically, and I knock on

wood when I say so. Mentally is another matter, and I find as others do, that to remember proper names is a great difficulty. As is our custom, we spent the summer at Marion, which is within reasonable distance of Boston, so I kept an eye on my office at least two days a week. This was not so for July, which I tried to take off completely. But I got fooled by seven meetings, which carried a fee with them, so I felt compelled to go. Sailing has become something of a chore, and in Buzzards Bay it is always choppy, which wrecks my back. Hence we putter around in the harbor with the 3 h.p. outboard, which gets us there eventually, but not at 20 miles per hour or more. We keep track of quite a few of our local M.I.T. friends including the Stevenses and the Lunns. **Enos Curtin** comes up this way at regular intervals for meetings, one of which was yesterday, October 17. A few of us went off to lunch and we caught up with Enos, who had not appeared in Boston for about a month. He wheeled off to get a 2:30 shuttle back to New York, where he seems to be as busy as can be with the Madison Square Building around the old Pennsylvania station." . . . The Long Range Planning Committee reports that letters from wives and widows give good notes. Your secretaries would certainly welcome same. . . . The New York group resumed their regular monthly luncheons on November 10 at the Chemists' Club, 52 East 41st Street, about as handy a spot as exists! Two announcement postals were sent out for this meeting, one of which was a new one which gives all the dates up to our 50th Reunion. Anyone wanting one, please request same. Come in and get re-acquainted before the 50th! One communication from an absentee reads as follows: "Pat and I take off tomorrow for a visit in Florida, so I cannot make it on the 10th. Hope to be with you on December 8th," signed **Bob Erb**. . . . **Ray Brooks** writes, "If possible will make the luncheon." Sorry it was impossible, Ray, as we missed you. Maybe we will have a snapshot in the next issue showing you the '17 corner at the club. "My philosophy has not changed—just take each day as it comes and enjoy it for all it is worth. Mrs. Brooks now recuperating from major surgery, thank the good Lord, and we hope to be with you all in Cambridge for the big doings next June." . . . Seventeeners continue on the move, here are some new addresses and let us have some comments from these fellows for the class notes: **Albert W. Chase**, 21 Rockhill St., Foxboro, Mass. 02035; **Lewis W. Douglas**, Southern Arizona Bank & Trust Bldg., 150 North Stone Ave., Tucson, Ariz. 85702; **Charles C. Gager**, 1045 Hillsboro Beach, Pompano Beach, Fla. 33062; **Fernald E. Hulse**, 99 Highland Ave., Somerville, Mass. 02143; **Earl C. Lewis**, 300 Lynnshore Dr., Apt. 708, Lynn, Mass. 01902; **L. Howard Littlefield**, 4200 Laurel Canyon Blvd., Studio City, Calif. 91604; **Harry A. Wansker**, 7641 Sandalwood Way, Sarasota, Fla. 33581—Vincent takes notice; **Leon R. Westbrook**, 21778 Seabury Ave., Fairview Park, Ohio 44126. . . . Our 50th Reunion Committee reports progress with the preparations. **Tubby Strout** keeps in touch with the manage-

ment at Chatham Bars Inn and everything is under control. It has been decided to have a cardinal color blazer for our official reunion dress. It will be of very good value and quality and good for later wear. The manufacturer's code will be used by us to assure proper fittings. More on this later! Make your plans now to be in Cambridge and on the Cape next June 9-10-11 and 12th.—**C. Dix Proctor**, Secretary, P.O. Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, Apt. 22, 1572 Mass. Ave., Cambridge, Mass. 02138

'18

The mind is surely the best in man, and its cultivation usually produces gentler and more sensitive folk. Surely it produces unseen powers contributing aid to human needs in areas besides science and engineering. The letter **Sherman MacGregor** wrote for last month's notes, as an aid to a class secretary's needs, was promptly acknowledged as, most of us have learned with many a backsliding, is proper. With glowing impulse he wrote again, "I had no realization that an unsought-for letter, used to fill the class notes, would be translated into such a full share of joy for you. I hope your heart is strong enough to bear such shocks. It makes me wonder about the job of being a class secretary. It must be a lot of work all the time. When the next opportunity comes to make a valuable contribution to your happiness, via the edification of the brethren, I'll warn you in advance." . . . **John Kilduff** writes that contributions toward giving a modest financial assist to people who otherwise would not be able to attend our 50th reunion can be placed in the hands of Joseph Snyder, '44, M.I.T. treasurer, where they will draw interest until June 1968. The clock continues to tick faster as that time approaches. John went on to say that **Tom Kelly** was in Europe but would be back the latter part of October. We dutifully telephoned Tom on the very day of his return, to which he responded with the following account of the flavor and significance of his sojourn. "I was happy to hear your voice over the phone last Friday night and to know you are in excellent health and still performing your professorial duties. I really haven't had time to collect my thoughts, but I will relate to you some of the highlights. After a smooth flight to Shannon Airport, we drove to Dromoland Castle which is about 10 miles away. This is not a very old castle. Most of it dates back only to 1835. A few years ago it was purchased by a wealthy American and completely redecorated by the Dorothy Draper Associates. Its accommodations are excellent as are the food and refreshments. The castle is filled with ancestral pictures of the Baron Inchiquin who sold it. The grounds are beautiful—with golf course, trout pond, stream, and riding facilities. The estate covers about 1700 acres so there is plenty of room to get about. One thing was immediately evident all over Ireland, and that was no air pollution, drinking water without chemicals, and the

cleanliness of the roads, whether hard-topped or dirt side roads. There was a complete absence of empty beer cans, beer bottles or other litter. We next moved down to Killarney to the Great Southern Hotel. The highlight of our stay was a drive through the Ring of Kerry, some of the most beautiful scenery that I have ever seen. In the southwestern part of Ireland we stopped at a small town called Park Na-Silla. There is a large summer hotel there, also owned by the Great Southern, which has a striking setting on top of a bluff overlooking the water. The extensive grounds feature a semi-tropical park where a great variety of palm trees grow. This is due to its nearness to the Gulf Stream. We were too late for the rhododendron blossoms but we saw thousands of the bushes which are beautiful in May and June when in full bloom. We next went to the northern part of Ireland to a village named Cong where Ashford Castle is located on a large lake. The old part of the castle dates back to the 12th century, but in the middle of the 19th century the head of the Guinness Stout family bought it. He and his heir spent fabulous sums restoring and adding to it. It is a beautiful place for a vacation with fishing, riding, walks, etc. It was our headquarters for touring the surrounding country where the scenery is gorgeous and a good deal like Vermont. We went to Dublin next, a clean city and one we greatly enjoyed. Near the center of the city is St. Stephen's Green which is a large and beautiful park. It has many flower gardens, a large pond, and a great variety of trees, with the principal hotels and the main shopping center bordering it. I wanted to see Trinity College which also borders it and is almost a duplicate of Trinity College, Oxford. The professors and the curriculum are similar, as are the cold rooms and drafty courtyard. As you know, Trinity College, Dublin, is the alma mater of Dean Swift and Oliver Goldsmith. The *Book of Kells*, the ancient and most beautiful illuminated copy of the Gospels in the world, is now in the library. Written during the first half of the ninth century, it was a thrill to see. We also wanted to see St. Patrick's Cathedral which dates back to Norman times. It is a large, beautiful cathedral and a fine example of Gothic architecture. While there, one of the deacons took us in tow and after guiding us through, showed us the organ. It is famous for its tonal qualities of which he gave us a demonstration by playing a hymn. While staying in Dublin, we drove south and west to the Hills of Wicklow which range in height up to 3000 feet. They are beautiful with their green sides, waterfalls, and wooded summits. On the trip we went through extensive farming country where grains of various kinds are the principal crop. It also is noted for its large sheep and dairy production. Altogether, Ireland was a very rewarding visit. We next flew to London. I had been looking forward to our stay in England because there were so many places I wanted to go to and so many things I wanted to see. After resting for the balance of the day, we first went to Canterbury Cathedral. This was built by the Normans not long after William the

Conqueror consolidated his gains following the Battle of Hastings in 1066. It is a beautiful edifice with magnificent stained glass windows. It has the first evidence in Norman architecture to show a slight point in the Gothic arches of the windows. We were fortunate here to meet a canon of the Cathedral who spent almost an hour showing us the most important and interesting features, as well as a summary of the essential highlights of its history. This included Archbishop Thomas à Becket's tomb and the reasons why Henry II ordered his murder. (He wanted money.) I asked the canon to give me his name. He said it was rather humorous when combined with his Cathedral office. His name was Ball. Our Canterbury day was most enjoyable, made especially so by Canon Ball. From London we drove to Henley and Oxford. I was surprised to learn the enrollment at Oxford is over 25,000 students. We visited about six of the 28 colleges. American college students would be amazed at the rugged living accommodations. We wanted very much to see Stratford and to attend a production at the new theatre. It is a most interesting old town on the Avon. The homes were either very old or old. We visited Ann Hathaway's home among many other noted places. I had seen a few Shakespearean productions, among which were the compulsory ones we had to attend when in school. This time we saw *Henry IV*, Part 2, which lasted three hours. It was a revelation to me to see Shakespeare played by such a very competent cast. The scenes, the characters, the costumes, and the whole production was so realistic you felt you actually lived it. The three hours went by unnoticed. I have never enjoyed a play so much. The next few days were spent back in London. We visited the usual places of interest including The Tower, Westminster Abbey, and Parliament buildings. We also enjoyed England very much. Rome was our next objective. Its history goes back to its founding many years B.C. We visited the well-known famous ruins, St. Peter's, the Sistine Chapel with its priceless paintings. There is so much to see there. While in Rome we drove east toward the mountains to Tivoli to the ruins of Hadrian's Palace and the Villa D'Este with its magnificent gardens. Tivoli was the summer resort of many Roman emperors and noblemen. We had arranged to have lunch at a delightful place on the banks of a river that flows in a gorge below the outdoor dining area which was also beside the ruins of the Temple of Sybil. We dined on fresh trout caught that morning in the river. After returning to Rome we spent a few more days touring and then took a plane for home." . . . During our telephone conversation Tom told us he saw the Pope—from a proper ecclesiastical distance. I don't know whether this included a group blessing, but Tom certainly has mine. Sometimes even two letters, wistfully begging a classmate for a word as to how he has fared and what news he has to offer, are either inadequately phrased or find the recipient too enfeebled to take quill in hand. A letter to Mrs. Freda Rich, currently Class Notes editor for the *Review*, brought a

reply which, with its essential courtesy and shining goodness, would make any dim hour bright with unseen powers contributing to human needs. **Frank Pearson** is now beyond the touch of gentler and more sensitive folk. He died last January 30th in Flushing, Mich. I have no further details.—**F. Alexander Magoun**, Secretary, Jaffrey, N.H. 03452

'19

We are sorry to report the death of **George McCreery** in October. George died at sea while returning from England on the Queen Mary. He was president of the George W. McCreery Company for over 35 years and served as president of the Building Trades and Employers Association of Boston. George was a loyal member of our class, and an active member of the Alumni Association. At his death he was a member of the Alumni Council, but of particular note was the fact that he had served as Class Agent since the inception of the Fund in 1940. This is a record achieved by only one other Agent. On October 24 at the Alumni Council meeting it was planned to present him with a certificate of recognition in honor of his long and devoted service. The medal was forwarded to his widow. . . . The newly formed Corporation Development Committee includes the following members of 1919: **Howard Mc-Clintic**, **Larry Riegel**, **Charles Chayne**, **Ben Bristol** and **Paul Sheeline**. . . . **Nelson Bond** is in the Defense Communications Agency engineering office and is living at 3900 Watson Place N.W., Washington, D.C. . . . **Wayland Bailey** has just applied for P.E. in N.Y. state. He hopes to work with Earle Allen, revamping some of New York's lift bridges. He has eight grandchildren and all are well. He had just heard from Winchester Blake, '23.

. . . **Ed Deacon** at 74 keeps active in his business and is engaged in civic prospects and politics. He has seven grandchildren. His son-in-law is Major-General D. V. Bennett, Superintendent of the Military Academy at West Point. His son, Edward F. Deacon, Jr., is vice-president of the Contract Carpet Engineering Division of the Aldon Rug Mills in Lenrie, Pa. . . . Ben Bristol says, "No rest for the wicked." He visited England and Holland this fall on business, spent a few days fishing in Maine and Newfoundland in the summer, and attended several of the activities at M.I.T. this fall. . . . **Thomas Bott, Jr.**, retired from the Beverly Savings Bank as executive vice-president, as of September 30, 1966, after being with the bank 45½ years. . . . **Aubrey Ames** says his chief occupation these days is cleaning up seven acres of burned-over woodland on his country place in California. "We got in the path of a big forest fire two years ago. Also, I vary the routine with some fishing and golf, neither one with any outstanding success." He expects to be on hand for the 50th. . . . **Laurence Gillett** writes, "Enjoying retirement very much. Spring and fall in Norfolk, summer in New Hampshire, part of the winter in Florida. Doing a little writing on my old love—

railroads. Am treasurer of my church and am making a big job of it because I like it so much." . . . **George Bond** had a very pleasant summer at his shore cottage with all his family visiting at various times, including the nine grandchildren. "My older son finally got married last May, the last hold-out. Visited my younger daughter near Chicago last month and am about to visit my older daughter near Boston. I keep mighty busy with civic affairs and hobbies, having just completed heading up the United Fund here. I always look first for class news in the *Review* so I hope some of the other fellows write in." . . . **Dan Hall** retired on September 1, 1966, after 20 years as Plant Superintendent of the Gloucester City, N.J., plant of the New Jersey Zinc Company manufacturing titanium dioxide. "About a month before, I attended 'Doc' Flynn's farewell retirement party from the same company in New York. Doc had about 47 years with them. My eyes are failing fast, otherwise my wife and I are fine." . . . **Bill Snow**, 69, passed away in October. He was owner of the firm, Gibson-Lee, Inc., vice-president of the Hampton Paper Products, Inc., member of the Dedham Country & Polo Club, member of the board of Governors of the Acoaxet Club of Westport Harbor, Norfolk Associates, Dedham Historical Society and the Society in Dedham for the Apprehending of Horse Thieves. We shall miss Bill. . . . Your secretary leaves for Florida soon and will be there from December 1 to April 1. I hope that any '19ers who are near Delray Beach will look me up at 1111 Casuarina Road.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y.

'20

A meeting of interest and significance to the class was held recently at the Faculty Club in Cambridge. Present were **Bob Patterson**, Chairman of the 50-year Class Gift Committee, **Ed Ryer**, Chairman of the 50-year Class Reunion Committee, **Pete Lavedan**, in charge of deferred gifts and bequests, **Norrie Abbott**, Class President, **Perk Bugbee**, one of our two class agents for the Alumni Fund, and your perennial Class Secretary. **Al Burke**, our other class agent, was slated to be there but was unable to make it. It was a highly optimistic group, and the results of its discussions would make you equally optimistic about the 50-year prospects. You'll be hearing from Bob and Ed and Pete in due course so I need not go into further detail at this point. . . . A most welcomed letter from **Pete Ash** says, "I was sure sorry to miss our 45th, but I found out that a honeymoon was a very gratifying and stimulating substitute." He promises that he and Mrs. Ash will be at the 50th. Pete, who lives in Mahwah, N.J., says that the favorite neighborhood sport is a most sophisticated version of croquet, called "crokash." Although he is too modest to say so, we surmise from the name that "crokash" is named for its inventor. It sounds like a most interesting and improved version of a time-honored diver-

sion, and if any of you are interested I shall be glad to loan you the copy of the rather elaborate rules that Pete sent me—or, better still, write P. D. Ash, Mahwah, N. J., and get the low-down right from the horse's mouth. . . . I think I mentioned that **Lee Thomas** maintained an office in Philadelphia but I don't think I gave his home address, which is 307 Keithwood Rd., Wynnewood, Pa. **Al Thominson**'s pleasant sounding address is "By the Way," Pinehurst, N.C. . . . **Ernie Bangratz** is in Pittsburgh, address 40C Sandune Court. . . . **Harold Bibber** remains in Schenectady, address 2147 McClellan St. . . . **Fred Crapo** is in Muncie, Ind., 4300 W. Jackson St. . . . **Arthur Miles**, who was a rear admiral, is now a vice admiral. . . . **George Morgan**, who was president of his local M.I.T. Club in Beaumont, Texas, is now the Club's honorary secretary. . . . Word was recently received of the death of **Paul F. Corbin** of Melrose, Mass. No details were given.—**Harold Bugbee**, 21 Everell Rd., Winchester, Mass. 01890

'21

Happy New Year! We specially mark this fiftieth anniversary year of the formation of the class of 1921 in the fall of 1917 with a celebration in connection with the Fiesta of the M.I.T. Club of Mexico next March 9-11. In 1960 we held one of our interim reunions at this annual Fiesta in Mexico City, which proved so enjoyable that there has been a demand to have another reunion there to observe our golden anniversary. At this early writing a dozen couples are planning the trip, and you can still join the group if you act quickly per the suggestions covered later in these notes. The bright November day on which these words are being written is witnessing a dramatic major step in U.S. space achievements, with the final Gemini capsule in flight and the atmosphere fully charged here in this little borough of Brielle, N.J., where our good neighbors, Col. Edwin E. Aldrin, '17, and Mrs. Aldrin are glued to their television set. Their relatives and friends everywhere are congratulating them on the superlative success of their son, Major Edwin E. Aldrin, Jr., '63, and Command Pilot James Lovell, and praying that the superb conduct of the experiment will continue to their safe return. Prior to takeoff the officers of the M.I.T. Club of Northern New Jersey gleefully announced their master stroke in obtaining young Buzz Aldrin's acceptance of an invitation to be the Club's speaker at the February 28, 1967, meeting on the subject of manned space flight. . . . Commander **George F. B. Owens**, U.S.N.R. (Ret.), writes that he and Muriel have closed their New York residence for the winter and are again at their home at 745 Greentwig Rd., Vero Beach, Fla. 32960. George says that mail should be addressed to P.O. Box 3025. . . . At long last **Ray D. Cooper** is listed correctly on official records. He and Vina live at 6850 South Shore Drive, Chicago, Ill. 60649. . . . **Benjamin Fisher** says that he and Mary live at 30 Van

Brunt Ave., Dedham, Mass. 02026. Ben retired in 1964 as secretary and assistant treasurer of the Kendall Company. He is a trustee of the Dedham Institute for Savings and a director of the Financial Publishing Company of Boston. He serves as a member of the North Woods Camp Committee of the Boston Y.M.C.A. and is clerk of the First Church, Dedham. His memberships include the Dedham Country Club and the St. Anthony Club of New York City. Son Stephen attends Colby College; Andrew is at Noble and Greenough; Margaret is in junior high. . . . Never to be outdone, **Jackson W. Kendall**, 401 Hermosa Pl., South Pasadena, Calif. 91030, eclipsed our flag-bearing first day cover with a gorgeous post card of the Memling painting from the Andrew Mellon collection in the National Gallery of Art, franked on its first day with the Christmas stamp that bears a portion of that painting. Thanks, Marge and Jack, for a real collector's item! . . . **Arnold C. Rood** gives his home address as 1848 Commonwealth Ave., Brighton, Mass. 02135. He is special assistant attorney general of the Commonwealth of Massachusetts, with offices in the State House, Boston. Wish you would return that recent questionnaire, Ace, to help us prepare the Class Directory we are undertaking to complete well in advance of our 50th Reunion! . . . The questionnaire is also due us from **A. Abba Orlinger**, who has moved his activities as a patent attorney to new offices in Room 2820, Graybar Building, 420 Lexington Ave., New York, N.Y. 10017. . . . **Charles L. Phillips** operates the Rancho del Socorro, P.O. Box 7727, Tucson, Ariz. 85713, and we need his questionnaire to tell you more of the activities on the range. . . . **Edmund E. Brady**, Vice-president of Atwood and Morrill Company, has a new home at 3020 Tilden St., N.W., Washington, D.C. 20008, and we hope is he readying that questionnaire for us in his spare time. . . . **Elmer W. Davis** retired in 1958 from Elmer W. Davis, Inc., and the Ontario Building Supply Company, Inc., both of which are Rochester, N.Y., firms he had organized and directed. He and Beryl have two married sons, James, a graduate of Miami University, and Charles, St. Lawrence, and ten grandchildren. Elmer is active in the University Club of Rochester. He lives at 1600 East Ave., Apt. 1106, Rochester, N.Y. 14610.

With all the exercises '21 had in report writing at the Great White Factory on the Charles, we have long since discovered that the distaff side of the family is unsurpassed in contributions to these columns. Witness the case of the **Leon A. Lloyd** family of 35 Spruce St., Westerly, R.I. 02891. Al has been a pretty good contributor over the years, but now let us introduce Emma, who writes, in part: "Dear Maxine and Cac—Last June, when we received the favors at the reunion, little did we realize all their uses. They are primarily for a desk, but let me tell you of another application. My 'Y' Garden Club staged a flower show, with one class for husbands of members. To quote Al: 'In a weak moment, I said yes.' But he thought no more about the exhibit until

the day our grandchildren and their parents left. Then Al realized that the show opened the next day and he had to think fast. The arrangement was specified to be for 'Son or daughter in college.' Al came up with the idea of using our '21 favors with their gold M.I.T. seals. He got a soft shade green desk blotter, filled the pencil holder with yellow pencils and pens and placed it at the right rear of the blotter. Near it was a bright yellow architect's scale. At the left he placed the envelope holder, containing a vase with golden coxcomb and Mexican marigolds. At front left was a triangle. The title Al put on his entry card was: 'Study hard, son!' The judges gave him the blue ribbon in the men's class. On back of the entry card, their comment was: 'Good arrangement—he made all A's.' Did you know that **Ed Farrand** planned to sell his property in Georgia? Our daughter Edith's mother-in-law lives in Smithville about ten miles from where the Farrands are in Leesburg. We have seen Helen and Ed on those occasions when we have stayed in Smithville. At the reunion Ed indicated he was beginning to feel he had too much responsibility in taking care of the extensive property and, having seen it, we can readily agree. Our son David is here for a month on a special training program at the Electric Boat Company in Groton, Conn. Like all the naval reactor programs, the days are long and much is crowded into the training, including Saturday and Sunday. However, we are very thankful that he was assigned for his shipyard training to a place nearby so that he could live at home. His wife is working in Washington and visiting here on weekends. Our plans are for Christmas in Atlanta with Edith and the grandchildren. Barbara and her husband will be with us for Thanksgiving. We trust that you are both in good health and will have a pleasant holiday season. Al sends his best." Sincere thanks, Emma, for your interesting news. Our best to Al, too. . . . Amid the furor of phone calls from **Ray St. Laurent**, letters from bigwigs of the M.I.T. Club of Mexico, the exchange of tape recordings with our authorities on Mexico—the Dubé family—and your replies to Ray's letter to everyone in the class, it's difficult to predict, at this early November date, just what our '21 participation will be at the Club's nineteenth annual Fiesta on March 9, 10 and 11, 1967. The following couples are now planning to attend the celebration and to spend a week or so afterwards in visiting various places of interest elsewhere in Mexico: Helen and **Mich Bawden**, Mary Louise and **Rich Clark**, Maxine and **Cac Clarke**, Vina and **Ray Cooper**, Maida and **Ed Dubé**, Alex and **Munnie Hawes**, Ruth and **Irv Jakobson**, Jo and **Bill Loesch**, Helen and **Bob Miller**, Kay and **Phil Nelles**, Muriel and **George Owens**, Helen and **Ray St. Laurent**. If you did not reply to the class letter and would now like to make arrangements, contact Raymond A. St. Laurent, 47 Gerard St., Manchester, Conn. 06040, telephone 203 643-6056, and also write to the Secretary-treasurer of the M.I.T. Club of Mexico, Armando Sant'cruz B. '54, Reforma 116-804, Mexico 6, D.F., Mexico. Copies of your letters, sent

to your Secretaries, will aid considerably in maintaining these columns as you and we would like to have them. . . . Speaking of tape recordings, your Secretary has acquired a four-track monaural tape recorder, which will operate at all three standard speeds and take reels up to the 7-inch size. Your correspondence is invited via this medium if it will be any easier or simpler for you than longhand letters or the use of a typewriter. This offer does NOT extend, however, to those outstanding '21 questionnaires distributed prior to our 45th Reunion! On request to your Secretary, we will gladly send you a blank form if you have mislaid those which were mailed. Our cordial thanks go to you in advance for returning the completed form at once. . . . Commander **Robert B. P. Crawford**, U.S.N.R. (Ret.), is a consulting engineer with offices at 5102 Beachcomber, Oxnard, Calif. 93030. . . . **Myer Weisman**, formerly division engineer in the New York City Department of Water Supply, Gas and Electricity, has moved to California and we assume this indicates his retirement. He can now be reached at 817 St. Andrews Pl., Los Angeles, Calif. 90005. . . . Dr. **Francis O. Holmes** has retired from his associate professorship at Rockefeller Institute, New York City, and reports a new home address at Craney Hill Rd., Henniker, N.H. 03432. Questionnaires are requested from both Myer and Francis! . . . Those perennial travelers, Rigi and **Saul Silverstein**, embarked in September on Saul's twenty-second foreign trip since 1952. The itinerary called for a week in Rotterdam, where Saul attended the fourteenth International Management Congress of the Conseil International de l'Organisation Scientifique (C.I.O.S.) as a representative of the Council for International Progress in Management. The theme of this year's congress was "Management and Growth." Afterwards he spent two weeks attending to business matters of Rogers Corporation in the Netherlands, England, France, Belgium and Germany. Then a few days each in Poland, Rumania, Bulgaria and Greece, researching current management. From Athens Rigi went to Rome and then sailed for New York from Naples. Saul continued eastward to Israel for a week of management meetings and seminars. The next three weeks were filled with business matters in India and Japan, followed by a brief rest in Honolulu on the way home. An air mail post card to Maxine and your Secretary from Warsaw says: "Hi! Next Rumania, Bulgaria, Israel, India, Japan and then HEAVEN (Connecticut). Regards from Rigi and Saul." To date we have received seven of Saul's most interesting diaries with his piquant comments, covering the trip up to his first few days in Israel. Meanwhile announcements from Rogers say that the company continues to accent its research and development program, to increase sales and profits, to expand current product lines and add new ones and to build new plants and warehousing space—the latest being in Arizona. . . . **Harold N. Ewertz** heads the Harold N. Ewertz Company, P.O. Box 30, Cranford, N.J. 07016—manufacturer's representatives. Harold and Marion have

four children and eighteen grandchildren. . . . Dr. **Russell B. Tewksbury** gives a new home address as 12614 Eldrid Court, Silver Spring, Md. 20904, but did not return the questionnaire to indicate his current activities. . . . **Thomas W. Proctor**, Box 37, R.F.D. 1, Darlington, Md. 21034, retired in 1962 as senior engineer in the structural test department of Martin Marietta Corporation, Baltimore, Md. A registered professional engineer, he is a member of the American Society of Civil Engineers. Tom and Constance have a married son and three grandchildren. . . . Our distinguished classmate, Dr. **Augustus B. Kinzel**, retired vice-president for research of Union Carbide Corporation, is continuing his many other activities at such a pace as to require our assigning an entire issue of these notes to him—which still would probably not do full justice. Gus had planned to attend our 45th Reunion last June but his commitment to deliver the commencement address at Worcester Polytechnic Institute conflicted. Earlier, he had addressed the management luncheon of the American Foundrymen's Society. He was honored as the 1966 recipient of the Washington Award of the Western Society of Engineers "for advancing the role of the engineer in industry and education and for developing the National Academy of Engineering." It was also noted that he had pioneered in research in ferroalloys, deoxidation, and in pressure vessel design. Gus was the first president of the National Academy of Engineering and is president of the Salk Institute for Biological Studies. He was elected to Tau Beta Pi in 1965 and is the author of an article on the National Academy of Engineering which appeared in the April, 1966, issue of *The Bent of Tau Beta Pi*. A writer of note, Gus reviewed for the summer 1966 issue of the Engineers Joint Council's *Engineer* a book entitled *The Language of Life*, by George and Muriel Beadle. He wrote, in part: "The Language of Life, which summarizes the science of genetics and its historical development, is a must for any engineer who appreciates that to best serve humans—engineering's primary purpose—he must understand man as a biological entity." The most recent news of this active man is his election as chairman of the executive committee of System Development Corporation of Santa Monica, Calif. Gus has seven honorary degrees and forty patents. He is a director of the American Optical Company, Sprague Electric Company, the MITRE Corporation and General American Investors. . . . **Alfred C. Garrigus** is president and treasurer of the C. G. Garrigus Company, Haddam, Conn. 06438, but we have no additional data. . . . Writing from his home at 203 Baldwin Path, Deer Park, L.I., N.Y. 11729, **Allen Addicks** says: "I have been meaning to write you for some time. It was a great feeling to see so many of my old classmates again last June. It was my first reunion. These men, aided by their splendid wives, have come through the battle of life with great achievements and contributions to the welfare of the country. In this era of change to we know not what, it was reassuring to sense and to

feel their strength and stability. It made me proud of M.I.T. in general and the class of '21 in particular. You and Ray St. Laurent and **Mel Jenney** are doing great work in holding the class and its memories together. M.I.T. may have sometimes seemed like a heartless taskmaster in our school days, but actually it was a strong father preparing us for the sternness of life. The success of its efforts shone throughout at Groton. Pardon me if I sound sentimental, Cac, but after all I hadn't seen the class for 45 years and I mean everything I say. Mary and I want to be remembered to Maxine. Best regards." Thanks, Allen; be sure you're one of the first to sign up for our 50th Reunion! . . . **Ernest Henderson**, Chairman of the Board of the Sheraton Corporation, married Miss Faryl Finn of Cambridge, Mass., a graduate of Boston University School of Public Relations. Ernie authored the best seller, *The World of Mr. Sheraton*, a story of how his \$400 million hotel empire was started with \$1000 in his student days. . . . Addresses have been received for the following members of the class and can be obtained by writing to your Secretary: **G. Ring Amundsen**, **Warren K. Brimblecom**, **Albert Calvert**, **Frank H. Coldwell**, Brig. Gen. **Merle H. Davis**, **John Dobbie, Jr.**, **Ditlef J. F. Hald**, **Walter J. Hamburger**, **Donald D. James**, **Alexander J. LaPointe**, **Rodman McClintock**, **Philip Meyer**, **Donald W. Randolph**, **Isadore H. Rogovin**, **William H. F. Rose, Jr.**, **Harry Rosenfield**, **Edson I. Schock**, **Morris F. Sheldon**, **Ralph H. Wallace**, **Edmund S. Whitman**, **Harding DeC. Williams**. . . . With heavy heart, we record the passing of Dr. **Merrill Arthur Youtz** on September 21, 1964, and extend sincere sympathy to his family on behalf of the Class of '21. Born on December 9, 1894, in Indianola, Iowa, he attended secondary schools and Lawrence College in Appleton, Wis. He was graduated in 1916 with the B.A. degree, magna cum laude, as a member of Phi Beta Kappa. He was associated with us as a graduate student in Course V, obtaining the master's degree and his doctorate in 1922. At Technology he played the saxophone in the M.I.T. Orchestra and will be remembered as a member of the famous saxophone sextet that appeared with the Orchestra and Tech Show. He had been a research chemist with Standard Oil Company, Indiana, and later with the Northern Paper Company, Green Bay, Wis. Well-known for his work in oil and paper chemistry, he then became associated with Battelle Memorial Institute, Columbus, Ohio, for fifteen years to his retirement in 1960, when he was retained as a consultant on government projects. He is survived by his widow, Margaret, of 1864 Riverside Dr., Apt. 3, Columbus, Ohio 43212; two daughters, Dorothy, of Indianapolis, Ind., and Mrs. Palmer Jackson, of Pacific Palisades, Calif.; two sons, Robert A. and Howard, of Columbus, Ohio; a sister, Mrs. A. F. Christopherson, of Flint, Mich.; and three grandchildren. We are indebted to Mrs. Youtz for aid in preparing these notes. . . . Calendar for '21: interim reunion to celebrate the formation of the class, March 9-11, 1967, M.I.T. Club of Mexico, Mexico, D.F. The class

will gather for luncheon and dinner at Alumni Day on campus in Cambridge, Monday, June 12, 1967. In wishing you and yours a wonderful year of health, happiness and prosperity, your Secretaries ask your continued help in sending them news of your business or retirement activities, your travels, your children and grandchildren. And don't forget to return that questionnaire to help us with the long task of the Class Directory—send for a blank if you need one. Sincere thanks.—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, c/o **Edwin T. Steffian** and Associates, 19 Temple Place, Boston, Mass. 02111

'22

Here we are in sunny old Buffalo with the temperature above 60° nearing the middle of November. Our United Fund totals over \$7,000,000 at 97% of the goal—so we are going to make it easily. Then your Secretary will return to the serious work of getting ready for our 45th Reunion at The Wianno Club in Osterville on the Cape. Our "thrill of the month" was a newsletter from President **Parke D. Appel**: "Dear Ferg: Was very glad to get your note and learn you are at your usual vocation of pushing Buffaloes into bigger and better things. Madeline and I had a ball while swinging through England and Scotland the last of May after flying to London by Pan Am. It seemed as though we spent most of our time feeding our faces in flight since we had dinner about nine and breakfast at one (Boston time). Saw several shows in London—*Owl and The Pussycat*, *Oliver*, *Hello Dolly*, *Palladium*, two of *Moliere* at the *Mermaid*, *Charlie My Boy*—all of which were done in the true British skill. Spent six days touring the historic and university spots in England and Scotland. Flew to Amsterdam and while at the Hilton bumped into Perc Bugbee and wife. Then on to Rotterdam, which I believe will be the most modern city in the world when they get it finished. Next was Brussels, and that square where all the guild buildings are is fabulous. On to Luxemburg, Bernkastle and Baden Baden. Saw many 15th and 16th century castles and buildings. Also stopped at Heidelberg for a good old German meal and Bavarian beer. Saw where some of the movie scenes in *The Sound of Music* were shot, including the college and old castle. Next beautiful Lucerne where the jewelers and other merchants were waiting for us with open arms and lots of temptation which we fell for—watches, pins and linens. Since we were there on Corpus Christie, we saw a tremendous parade of about 50,000 Catholics grouped by monastic orders. On to Innsbruck, Salzberg and Vienna, after a boat trip down the Rhine. (I'm wrong—this came before arrival in Lucerne and included a view of the Rhine Falls.) In Vienna we saw the Austrian treasure at the Palace and listened to Mozart and Beethoven. Saw the tremendous Russian Memorial and Fountain. We then went on to Ljubljana, Yugoslavia, where I was

greatly surprised at how modern and well-off the city was, excellent buses, modern electric trains, super-markets, hardware and camera stores. We visited a tremendous grotto and cave, the Postojnska Jama, riding into it for about two miles on an electric train, alighting and then walking about three miles, returning to the train to be hauled to daylight. I am told that it covers about 30 square miles underground. Next we spent a week in Italy visiting Venice, Florence, Rome and Pisa where we were overwhelmed with art, ancient ruins, Italian food and people doing their best to get you to fork over your lire. Now along the Riviera to Nice, Monte Carlo and Montpelier where the sun was warm, the bikinis not quite legal and the Casinos ready to have you try a go at chemin de fer, baccarat, black jack, roulette or just good old one arm bandits. Sunny Spain was next at Barcelona, Valencia and Madrid. In Madrid we met Joan and her companion, Maria. They have bought a "casa" where they can have fun in the summer. It is located in Malpica de Tajo which is southwest of Madrid about 50 miles and east of Toledo about 30 miles. We spent two weeks there and traveled Spain with two young ladies familiar with the language and customs, having a delightful time. We stayed at some of the Miradores, which are old castles and royal hunting lodges that the Spanish government has established for tourists. They are equal to the finest accommodations in Europe and are astonishingly low in price rates. On July 12th we flew from Madrid to Paris where we had three days to take in the historic places as well as those renowned for non-historic—or I guess flesh spots. We saw De Gaulle and his big parade of French weapons and soldiers. On our way to the Louvre we met Helge Holst, '31, and his family and spent a most enjoyable three hours with them at the Louvre and at Notre Dame. On the 15th we caught the boat train for Le Havre to board the France for New York. The trip was as smooth as could be all the way across. On the ship I met **Leland E. Thomas**, Course III, of our class. He is a house builder and has lived in Belmont all these years. Since I lived there also for 35 years, isn't it the strangest thing that this is the first time I have seen him since '22 to the best of my recollection. A sad note is that Betty Ferguson died the latter part of September. The funeral services were attended by **C. Yardley Chittick**, Robert Tonon, and myself. I have not seen Ferg since the Alumni Officers Conference in early September **Roy Stone**, **Dale Spoor**, **Ted Miller**, **Oscar Horovitz**, **Warren Ferguson**, and I attended. We missed you! The Inauguration of President Johnson was Tech's peak of display of pomp and circumstance in the very best of taste. The symphony, the choir, the procession and the talks and speeches were tops. This was followed by a luncheon in the old armory which has been completely renovated and is most attractive. In attendance were **H. W. McCurdy**, **C. George Dandrow**, Horovitz, Miller, **Joe Keenan**, Appel and their wives. I am in the process of taking the York rite degrees to be followed by the Shrine

in the Masonic orders. When I was at Tech I joined Maclaurin Lodge, and after I was married I joined Belmont Chapter. I've always wanted to do this but something else was always first in time and money. I have now joined the ranks of the Social Security sect. Have become a loafer in retirement in order to keep myself free to do whatever comes up if we wish such as more travel than we have had the opportunity to do. I'd appreciate it if you would give our 45th a big play in your notes, the Wianno Club at Wianno next to Osterville on Thursday evening June 8 through Sunday dinner, June 11th. Then up to Tech where we shall be housed Sunday and Monday, June 12th which is Alumni Day. We are going to make it the biggest and best in class history, God Willin! My very best to Dorothy and yourself from Delicious and Crab, Parke." Needless to say, we will hope that Madeline and Parke have many future pleasurable trips and will again share them with us.

A newspaper headline from the Dover Reporter (Mass.) tells of the appointment of **C. Herbert Taylor** as headmaster of the Dover-Sherborn Regional High School. They wrote that Mr. Taylor is a well-known career educator with a distinguished background in the schools of both Massachusetts and Rhode Island. He recently retired after 10 years as superintendent of schools in the City of Cranston, R.I. Mr. Taylor has taught courses at the University of Rhode Island, Rhode Island College, Roger Williams Junior College and Brown University. . . . **Oscar Horovitz** of Newton received one of ten Fine Work Prizes at the 5th Tokyo International Film Contest for his film *THE 104*. The prize and diploma was handed to a representative of our embassy in Tokyo at the prize awarding ceremony on November 4, 1966. . . . **C. George Dandrow**, one of the industry leaders, was honored at the 28th Annual Building Products Executives Conference in October. George is now a consultant on industrial marketing and was vice-president of Johns-Manville Sales Corporation and Chairman of the Conference. As George Dandrow's special medallion was presented, his citation read: "Building Products Executives Conference, Washington, D.C., October 13, 1966. 'On the occasion of its 75th anniversary, the F. W. Dodge Company, a division of McGraw-Hill, Inc., honors C. George Dandrow in recognition of his personal contributions to the success of the Conference and for his leadership in the building products industry.' They also noted that he is a life member and past president of the New York Building Congress which brings together all segments of the construction industry in New York for an exchange and a blending of ideas and knowledge. He has been in many community activities and has led campaigns for the Boy Scouts of greater New York. This organization awarded him the Silver Beaver Award, the highest award for service to youth presented by the Greater New York Council, Boy Scouts of America. They remind us that he was president of the M.I.T. Club of New York, president of the M.I.T. Alumni Association, Chair-

man of a visiting committee and a term member of M.I.T. Corporation. They also tell of his three gold medals as the north-eastern champion in the hammer throw, the discus and the 56 pound weight. (His throwing arm is still good). . . . The sympathy of our class is sincerely extended to Warren Ferguson and family. We will all miss Betty at the reunion. We also extend our sympathy to the family of **Garrett H. Barnes, Jr.**, of Akron, Ohio, and **Alexander A. Dedouloff**, Clinton Corners, N.Y. . . . Among the new addresses received are those of: **David A. Weill**, West Redding, Conn.; **Joseph C. Patty**, Greenville, Ohio; **Herbert Hickey**, Mattawan, Mich.; **Dr. Eastman Smith**, Mountain Home, Ark.; **Eugene V. B. Van Pelt, Jr.**, Lancaster, Va.; **Robert D. Stuart**, Pawtucket, R.I.; **William F. Barrett**, Springfield, Pa.; **Wilfrid M. Thomson**, San Francisco, Calif.; **Thomas H. West**, Boston, Mass.; **John W. Ingram**, Ridgewood, N.J.; **Albert J. R. Houston**, Evansville, Ill.; **Minot R. Edwards**, Houston, Texas; **Howard B. Sloan**, South Lynnfield, Mass.; **Dr. George G. Marvin**, Fort Meyers, Fla.; **Brig. Gen. Dwight F. Johns**, Piedmont, Calif.; **Prof. Frank A. Fletcher**, Hoverton, Pa.; **Jonathan Chace**, Little Compton, R.I.; **Frank D. Gage**, Long Beach, Calif.; **Winslow C. Morse**, San Diego, Calif.; **Clarendon P. Spofford**, Gardner, Mass.; **Merton Ticknor**, New Fields, N.H.; **Dr. Vernon E. Whitman**, Rochester, N.Y.; **Charles A. Williams**, Guilford, Conn.; **Donald F. Carpenter**, Martha's Vineyard, Mass. Of course the joys of the season are always extended to you all and may the New Year find you happy and healthy!—**Whitworth Ferguson**, Secretary, 333 Ellicott Street, Buffalo, N.Y. 14203; **Oscar Horovitz**, Assistant Secretary, 33 Island Street, Boston 9, Mass.

'23

As this is prepared, six weeks ahead of publication, the November issue of the *Technology Review* has not reached your Secretary (November 15). Nor have any clippings for the January issue of the *Review* been received from the Alumni office: only death notices and changes of address. For this reason, your Secretary is taking advantage of this opportunity to refer you to a letter from our class President, **David Skinner**, to all classmates on September 12, which points out that "plans for our 45th Reunion in 1968 are coming along" and that "we have a reservation for June 7, 8, and 9 at the Oyster Harbors Club on Cape Cod, and we hope you will plan to be there." Your Secretary would like to suggest that you begin your plans to attend right now by "killing three birds with one stone." A contribution to the Alumni Fund will do these three things: (1) Make you a participant in the Alumni Fund (2) Increase the percentage of classmate participation (3) Bring you the *Technology Review* with news of your classmates and what is going on at M.I.T. Further, if you will enclose a note telling about your own activities it will be forwarded to your class Secretary for inclusion in the Class News sec-

tion of the *Review*. Why not send in your contribution to the Alumni Fund right now and, in an accompanying note, let your classmates know what you are doing. The *Technology Review* and your class officers will keep you posted on plans for our 45th Reunion. In the meantime, your Secretary will welcome a card or letter from you at any time. Now, before you forget it, be sure to mark the dates of the 45th Class Reunion on your calendar: June 7, 8, and 9, 1968.

Word has been received from the Alumni office of the deaths of the following, but no further details are available at this time: **Frederick H. Bush**, Apartado Postal 510 Cuernavac Morelos, Mexico, in a hospital in Mexico City on June 8; **George A. Jenckes**, 702 Trent Ave., Wyomissing, Pa., on September 14; **Woodworth N. Murray**, Old Oaken Bucket Rd., Greenbush, Mass., on September 11; **Raymond F. Pugsley**, 14 Elm St., Mystic, Conn., on July 15; **Dale Purves**, 1011 E. Washington Lane, Philadelphia, Pa., on May 12; **Edwin C. Schatz**, 28 Central Avenue, Ravena, N.Y., on September 6. . . . The Alumni office advises of the following changes of address: **A. Griffin Ashcroft**, Chimney Point Rd., New Milford, Conn., 06776; **George E. Barnes**, University of North Carolina, 1303 Willow Drive, Chapel Hill, N.C. 27514; **Lewis T. Batt**, Pittsford, Vt. 05763; **Theodore F. Berghaus**, 3517 Washington Rd., West Palm Beach, Fla. 33405; **Hamilton J. Bickford**, R.D. #1, Winsted, Conn. 06098; **Malcolm L. Carey**, 120 Jean Brilliant, Roxboro, Quebec, Canada; **Warren N. Center**, 8 Maple Street, Topsfield, Mass. 01983; **Clarence V. Chamberlin**, 373 Lincoln Ave., E. Cranford, N.J. 07016; **Howard T. Clark**, 2 Mayflower Rd., Hallowell, Maine 04347; **Lewis K. Downing**, 3301 13th St., N.E., Washington D.C. 20017; **George W. Gilman**, 27½ Atlantic Ave., Rockport, Mass. 01966; **William B. Gurney**, 272 E. Circuit Dr., Beaumont, Texas 77706; **Batist R. Haueisen**, P.O. Box 68101; New Augusta, Ind. 46268; **Robert L. Hershey**, 101 North Beverwyck Rd., Lake Hiawatha, N.J. 07034; **A. Raymond Holden**, 2812 Woodcrest Dr., Sarasota, Fla. 33580; **Lowell L. Holmes**, 637 40th St., Sarasota, Fla. 33578; **Hou Y. Hsu**, Jardin Matheson & Company, Ltd., P.O. Box 70, Hong Kong, B.C.C. China; **Joseph P. Keegan**, Calderwood Baking Company, 61 Pleasant St., Portland, Maine 04111; **Joseph T. Martin**, P.O. Box 262, Dunkirk, Ind. 47336; **Eugene B. Mechling**, 1005 So. Upham St., Lakewood, Cal. 80226; **Sterner St. P. Meek**, 1119 N. Vista Del Mar Dr., Delray Beach, Fla. 33444; **Raymond M. Meekins**, 10, 706 Vale Rd., Oakton, Va. 22124; **John C. O'Flaherty**, 3715 South Gilphin St., Cherry Hills Village, Colo. 80110; **Charles V. Reeves**, 1243 Kurtz Rd., McLean, Va. 22101; **D. G. Brinton Thompson**, Trinity College, Hartford, Conn. 06106; **Chaplin Tyler**, 1014 Devon Apts., 2401 Pennsylvania Ave., Wilmington, Del. 19806; **Pierce J. Van Alstyne**, Skyway Acres, Airport Road, Billings, Mont. 59101; **Andrew E. Vaughan, Jr.**, Box 108, Pineola, N.C. 28662; **U. A. Whitaker**, 460 No. 25th St., Camp Hill, Pa. 17010—**Forest F.**

Lange, Secretary, 1196 Woodbury Ave., Portsmouth, N.H. 03801; **Bertrand A. McKitterick**, Assistant Secretary, 78 Fletcher St., Lowell, Mass. 10852

in recognition of his work in radiant heat transmission. It was the Max Jacob Memorial Award made last August at the third International Heat Transfer Conference in Chicago. . . . That will have to do it for now. A new year is upon us. May it be a good one for you all.—**Henry B. Kane**, Secretary, Lincoln Center, Mass., 01773

'24

After the flood of news last summer, the drought of fall is all the more noticeable. Even news clippings are notable by their absence. So here's the best we can do for reporting the activities of the presumably inactive class of 1924. Many of you have undoubtedly watched the M.I.T. Science Reporter on the Educational TV Network. It has national distribution. And probably you have wondered if the reporter, John T. Fitch, is a son or at least near relative of our **John D. Fitch**. There is a resemblance, that's for sure, and it's one of the first questions your Secretary asked John T. when we first met many years ago. (He's Class of '52.) The answer is "no." If there is relationship it's too remote to be of consequence. . . . **Richard D. Jackson** is the latest to raise the question. Seems the program has reached Florida and he has become a devotee. Dick claims he's semi-retired from his Jackson Grain Company in Tampa, but if feed and grain are no longer taking up all his attention, other things certainly are. He's a director of the First National Bank of Tampa, of the General Telephone Company of Florida, and of the Florida State Fair. He is on the Aviation and Agriculture Committees of the Greater Tampa Chamber of Commerce. And he also administers a couple of trusts "and tries to outguess the stock market." In his spare time Dick does a bit of fishing, as becomes a good Floridian, flies a Cessna 172, and is taking instruction in sail planes. For sailfishing? There are four grandchildren, and Dick has a quote that will be appreciated by many of us: "Oh how I love to hear the patter of little feet . . . going home." . . . We also have a new convert to the advantages of Florida living. **Theron P. Bailey** spent many years with the U.S. Engineers in Kentucky. Retiring a couple of years ago, he moved back to an old family home in southern New Hampshire. But the combination of high New England prices and cold New England winters got the Baileys down. So this fall they moved to Florida for good. They bought a trailer and are now luxuriating in a trailer camp outside Clearwater. . . . And to complete the Florida roll call, after **Cy Duevel** retired last winter, he and Mary immediately headed south for a Florida vacation. Evidently it took, for in October they trekked south again. They will be on Long Boat Key in Sarasota for the winter.

A pair of honors to report—**Sam Shulits** co-authored a paper entitled "Large-Scale Roughness in Open Channel Flow." It was evidently of some import, for in October the American Society of Civil Engineers awarded the two authors its Karl Emil Hilgard Hydraulic Prize. Professor Sam is in charge of both the fluid mechanics program and the hydraulics laboratory at Penn. State. The second award went to Professor **Hoyt C. Hottel**

'25

It may appear that the 45th Reunion is a long way off, but June of 1970 will be upon us before we know it! You should know that **Fred Greer** has agreed to be the chairman for our 45th, and **Ed Kussmaul** will serve as the vice-chairman. Fred is presently putting together his committee; and reservations have already been made for the reunion which will be held at Bald Peak Colony Club in Melvin Village, N.H.—only about a two-hour drive from Cambridge over excellent roads. You will be kept informed of things as they develop. . . . **Richard Feingold**, Secretary of the class of 1943, sent along a clipping from *The Hartford Times* of Wednesday, September 21, 1966, which noted that **Donald G. Vaughan**, Assistant Vice-president and Head of the Engineering Department of Aetna Life & Casualty, retired as of September 23. Don went with Aetna in 1933, became assistant manager of the engineering department in 1945, manager two years later, and secretary in 1954. He became assistant vice-president some six years ago. He has been active in numerous insurance and safety organizations, served as director and vice-president for industry of the National Safety Council, president and executive committee member of the American Society of Safety Engineers, and chairman of the Hartford Citizens' Traffic Safety Committee. . . . It is with sadness that I report the passing of two members of the class. **Robert C. West** died at Caldwell, N.J., on January 17, 1966, but word reached M.I.T. just recently. On July 27, 1966, Rear Admiral **James F. Cunniff**, USN, Retired, died at Tucson, Ariz. No details are available as yet.—**F. L. Foster**, Secretary, M.I.T., Room E19-702, Cambridge, Mass. 02139

'26

For the past hour your Secretary has been going through the class notes folder and spreading our clippings etc. on the floor around the wing chair. It looks cluttered enough for me to start. All that would be necessary would be for Ruth to open a door, or for the new pup to come dashing in. We haven't told you about Heather. She is a collie and now six months old. We thought long and seriously about another St. Bernard, and much as we wanted one, judgement prevailed. Heather is a little beauty, but it will be some time before I'm writing as I always did about Heidi, that she is curled up at my feet before the fireplace as I write class notes. Let's get back to the items

spread out on the floor. The first one hum, Draper has another gold medal. This one to quote from *Mechanical Engineering*, "Charles Stark Draper, Fellow ASME, was awarded the Vincent Bendix Award gold medal and citation for outstanding research contributions. Professor and head of the Department of Aeronautics and Astronautics, and director of the Instrumentation Laboratory at M.I.T., Cambridge, Mass. he is one of the world's leading space scientists." Congratulations, Stark, even though these gold medals are becoming a bit of an old story with you. Here is a clipping sent by John Drisko, '27, who happened to see it in the *New York Times*. "Xavier Tocate, a duck and goose calling guide from Quebec, charmed a flight of geese off their intended course the other morning and brought them in over the pit blind and decoys to the gunners. But the geese didn't fly quite low enough for a shot and they went off, except for one bird. That one was so dazzled by the display of calling that it couldn't resist circling for one more close, and fatal, look. With the goose's approach, the cover of the sunken blind was thrown back and Jose Juan de Olloqui, a visiting official from Mexico, dropped the bird neatly. It was the first Canada goose de Olloqui had bagged, and his enthusiasm was shared by his gunning companion, **Whitney Ashbridge** of Washington." This is the kind of accomplishment I like to see reported about a classmate now and then. Whit got his name in the paper because he was sitting in a duck blind with a fellow who shot a goose! . . .

The next one is a post card from London from **Pete Doelger**. I had just picked up the card at the post office and was walking with Heather when a new Rolls Royce bowed by with Pete waving frantically—he arrived back as soon as the card. . . .

When **George Leness** was here for reunion, he was president of Merrill Lynch, Pierce, Fenner and Smith. Professor Emeritus John Babcock, '10, has sent along a clipping from Portland, Maine, telling of George's election to chairman and chief executive office of the world's largest brokerage firm which I understand is known among banking circles as "We the people." A clipping from the Kettering, Ohio, *Times* tells about our Dayton classmate, "The election of **Kenneth P. Morse**, President of the Standard Register Company, to the Board of Directors of the Third National Bank and Trust Company was announced by Robert Ladd, President, following Tuesday's meeting of the Board. Mr. Morse is a veteran with over 40 years' experience in the printing and business forms industry. He joined Standard Register in 1937 as a development engineer. Mr. Morse was named president in 1964, and president and chief executive officer in 1966." . . . At reunion someone asked about **B. V. Howe** and remarked that if he were alive and well, he would surely be there because he never missed one. We regret to tell you that "B.V." was not alive at reunion time—we have no information beyond a form from the alumni register showing that he died in February 1966. The fishing expeditions to Mexico each winter for the past ten years now in retrospect were

fortunate—he enjoyed them so much. We will miss his interesting reports about them. . . . Another classmate conspicuously absent at reunion was **Bill Lowell**. We have just received a letter from Bill's wife Gertrude bringing us the sad news. Bill died of cancer on October 2. As you know, Bill was one of the country's leading lighting engineers as manager of technical liaison for Sylvania Electric Products and immediate past president of the Illuminating Engineering Society. Bill's achievements are well-known, but his character is best expressed by a paragraph in Mrs. Lowell's letter which I will quote, "His courage and spirit were amazing, and it was truly a privilege to be by his side to care for him both during his many long periods in the hospital and the time that he was at home." We have extended the sympathy of the class to Mrs. Lowell. News like this is not a pleasant note to finish the class notes, but we are running out of space. I must tell you though that it is gorgeous here at Pigeon Cove this mid November morning. The sea is covered with whitecaps offshore, but with the wind from the northwest we are protected along the shore. A lone hardy lobsterman is hauling pots right out front. It's too rough for the outside boats. The air is clear and the sun bright so I must not spend any more of this beautiful Sunday morning inside. So until February, cherio and a happy Washington's Birthday.—**George W. Smith**, E. I. DuPont de Nemours & Company, Inc., 140 Federal St., Boston, Mass.



PHOTO: D. MICHALS OF *Scientific American*

Harold W. Fisher, '27, Vice-president and Director of Standard Oil Company (New Jersey), is shown with part of his antique clock collection.

of the wives of the above chairmen, with Fran Bonnar as chairman.

Elwood J. Umbenhauer died July 11 in El Paso, where he was director of city water utilities. "Umby" came to Tech from Roseland, N.J., and four years later graduated in Course XI, sanitary engineering. He played basketball first on the freshman team and then three years on the varsity. In 1943 he moved from Laredo, Texas, to El Paso and by 1952 was superintendent of the department of water and sewers for the city. The American Water Works Association, in 1962, named him "Southwest Water Works Man of the Year, for his foresighted management of a water department serving a community of tremendous population growth and exceptionally little rainfall."

. . . **Oscar Cox**, who died October 4th, first attended M.I.T. and then Yale, where he received a bachelor of philosophy degree in 1927 and a law degree two years later. A prominent Washington lawyer, he served on many federal agencies during World War II, and was the author of the Lend-Lease Act and the G. I. Bill of Rights. It is interesting that the *New York Times* gave Oscar Cox the credit for having 'discovered' the 1892 statute on which the idea of leasing arms to Britain was based. After the war he was a partner in the law firm Cox, Langford and Brown and was director and counsel for many U.S. and foreign corporations.

The *Scientific American* magazine thought enough of a very good picture of **Bud Fisher** to run it as a full-page ad in

27

As I write this in early November, everything is really getting launched for the forthcoming 40th Reunion and the attendant Class Gift. Between now and June **Bud Fisher** will continue to carry the heavy load of putting together our 40th-year gift to M.I.T. He is going to need all the help he can get from contributors and from the solicitors who are working on his committee. **Glenn Jackson** has underlined the problem with his fabulous letter from Iran. Really a masterpiece: "Give freely, that Allah may smooth your journey through our fortieth year!" Our Class Agent, **Dick Hawkins**, is keeping us reminded of the need for generous giving this year above all others. . . . **Bob Bonnar** has been educating himself on the handling of past 40th reunions so that he can avoid past mistakes and capitalize on the best of previous 40ths. He has appointed committee chairmen who are undertaking the following jobs: **Ray Hibbert**, registration and chief greeter; **Bill Taggart**, hotel arrangements; **Joe Burley**, dining and photography (two jobs); **Ed Dunn**, transportation; **Joe Melhado**, historian—reading the histories of past reunions and writing up this one; **Joe Harris**, class records—you can expect to receive a request soon to bring your individual history up to date; **Dike Arnold**, sports coordination—with assists from **Ezra Stevens** for golf, **Anson Rosenthal** for fishing and **Dick Hawkins** for tennis. The ladies committee will consist

the *New York Times* (and probably elsewhere), pointing up the breadth of interests of a business leader with an engineering training. Bud is a vice-president and director of Standard Oil Company (New Jersey), and a trustee of Sloan-Kettering Institute for Cancer Research; the photograph shows him with his collection of antique clocks. . . . Glancing at the classnotes of December 1946, **Jim Lyles** was organizing the reunion committees for our 20th. (Jim is all set to be at the 40th). Jobs were assigned to **Bob Wise, Ralph Stober, Judas Priest, Dike Arnold, Glenn Jackson, Bob Bonnar, Wheat Hutchison, Dan Metzger, Frank Mesker, George Bergman, Pub Whittier, Bill Reed, Jim Henry** and many others. Colonel **Bill Sadtler** was with the Eighth Army in Yokohama. **Frank Crandell** was with Liberty Mutual in Boston and living in Wellesly Hills.—**Joseph S. Harris**, Secretary, Masons Islands, Mystic, Conn. 06355

'28

We might as well start these January notes with a rehash of considerable material that has been accumulating on **Jim Donovan's** desk this past month. We quote the Honorable Donovan: "Around the Boston area October 12 was a holiday so I was working, and into the office walked a man who asked for me but whom I didn't recognize. It turned out he was good old **Dud Smith** who came to our class from Hawaii, married **Chris Case's** pretty sister Betty, and over the last five or more years has been retired and living in Vista, Calif. Well, naturally, Dud was his own swell self; Betty was her own sweet self, the warm and pleasant Case that we knew so well from Chris. They seriously and enthusiastically invite any classmates who are in the vicinity of Vista to come and see them. Vista is about forty miles north of San Diego. The Smiths have two sons, one is manager of a bank and the other is a financial writer for a newspaper. Each son has three children, making a total of six grandchildren, and Dud and Betty enjoy them all. They were just back from a trip to Europe and were most gracious to drop in and see me." . . . And from **Cole Armstrong** a letter dated October 15: "Dear Jim: As a departure from my usual lazy habits and at the strong urging of **Max Parshall**, I am writing to give information about what has suddenly happened to me. I am retiring from the Bell Telephone Laboratories effective November 1 and accepting a position with the Government. I shall have the short title of Associate Director, National Communications in the Office of the Director of Telecommunications Management in the Executive Office of the President. This Office is responsible for the formulation and coordination of national policy in regard to communications for the government and for the communications industry in the country both nationally and internationally. This is a very challenging job, where I hope to be able to make a contribution to the progress of the indus-

try. This is a very considerable change in our way of living but, since our family is grown and now presenting us with grandchildren, there seems to be no reason why Maida and I shouldn't give the time we have left to the public service. Sounds like flag waving but should be fun too, particularly if we can do some good. On October 20 we are moving to 472 M St., SW, Washington, D.C. 20024, which, people tell us, is near where Vice President Humphrey just bought a place. I doubt that we shall move in his social circle however. I don't suppose that this move will do my ability to help with the reunion any good, but I'm still willing to do what I can. Will certainly try to make it anyway. Best regards. Army."

The first half of a letter from **Ted Hartshorne**, 15 Flying Point Rd., Stony Creek, Conn., tries to straighten out a contribution to the Alumni Fund; and after that he continues: "I retired as an active Olin employee on June 30 of this year. Since then I have spent a large part of my time touring New England and the Maritimes in our 'landcruiser.' It is a self-contained camper built on the chassis of a G.M.C. 1-ton truck. It has been lots of fun, and my wife and I expect to take it to Mexico this winter." . . . **Dick Rubin** from Dover, Mass., writes, "Count me in as one of the committee of the whole." . . . A note from **Shikao Ikehara** from his home in Tokyo states very definitely that he plans to be at the 40th . . . Jim also sent along three tearsheets from a recent issue of *Life* magazine that included a long story on "The Variable Sweep Vs. the Fixed Delta." Most of you scientists know that the basis for the article was an explanation of the long-standing feud between our own classmate **John Stack**, who developed the first variable-sweep plane to fly, which inspired Boeing SST, and Kelly Johnson, designer of Lockheed's most famous airplanes and who perfected fixed delta wing with 2,000 mph YF-12A. John, as many of us know, now supervises vertical take-off planes for Fairchild-Hiller. . . . The last of the accumulation from Donovan is a tearsheet from the October 3 issue of *C&EN*, which tells the world that the Goodyear Tire & Rubber Company is opening a scientific liaison office in Brussels, Belgium; and concludes with the statement that **A. J. Gracia**, vice-president for research at Goodyear, says that since many of the world's significant scientific advances come from European laboratories, it is desirable to spot such trends as soon as they start and not have to wait a year or two to learn about them in scientific journals. Al, I promise to eat a complete copy of this issue of *Tech Review* if I didn't quote you correctly this time. . . . And **H. E. Beebe**, '10, of Hollywood, Calif., sent us the 1965 Christmas card mailed by Dorothy and **Bob Hunn**, '28, which is an exquisite etching by Bob of the St. Alban's Episcopal Church on the U.C.L.A. campus. Bob Hunn was Course IV and now lives at 241 24th St., Santa Monica, Calif.

We are beginning to understand that the older we get the more confused and absent-minded we become. This was brought sharply home to us when we just

uncovered a very charming letter from Florence Jope that we had intended to use in November notes, to start off the season as it were. We know now that this missive will not be published until blizzly January, and Florence talks of Alumni Day last June and boat races of last April. We apologize for our tardiness, but here's the letter: "Thanks for your friendly note accompanying the letters you returned to me from M.I.T. '28ers. The only other '28 item I have to pass along is that Ted came home from Cornell for the weekend, and we attended the E.A.R.C. (Eastern Association of Rowing Colleges) Regatta at Lake Quinsigamond (Worcester, Mass.) last Saturday. This is a really spectacular affair in which about 75 crews representing 16 colleges participate. Every 15 minutes from 8:45 a.m. to 5:15 p.m.—with 2 hours out for lunch—there is another crew competition taking place—a beautiful piece of organization as well as athletic competition. Ralph took great delight in this annual affair, and was surprised and delighted when M.I.T. presented the Ralph T. Jope Cup to the E.A.R.C. in 1963. It has been awarded annually since then to the member college whose lightweight crews score the highest total points in the freshman, junior varsity and varsity races. Ralph had the pleasure of presenting it in person for three years, and I felt especially privileged to be asked to represent Ralph this year. Cornell won it the first two years and Harvard last year and this. However, M.I.T. tied in the point score for the Jope Cup this year but the decision was made to give it to Harvard as they had won the lightweight varsity race. (Better luck next year for M.I.T.!) This is always a Mecca for oarsmen of all classes—complete with families that swell the attendance figures to over 10,000 onlookers. Among the sun-and-wind-tanned audience were **Ernie** and Louise **Knight**, their son David and Mrs. David enthusiastically cheering for son Paul, who was a member of the Northeastern Heavyweight Freshman crew in Northeastern's first appearance at these sprint races. This was the first year for nine years that David has not been rowing—after being a member of last year's famous "Vesper" crew. Remembering Ernie's prowess with the oars, it's obvious that it's 'inherited.' Maybe you thought Ernie was tall in the "old days" but you should see him dwarfed beside those two sons! Louise and Ernie are busy with the students at Gould Academy in the winter and enjoying their old haunts in Raymond, Maine, in the summer. They spoke of the 40th reunion and their hopes of being among those present. I've dropped a note to Marie and **George Chatfield** to encourage them to come to Alumni Day this year. It would be fitting to call to the attention of those who remember Mrs. Jack that a memorial fund has been established in her honor, the income of which is to be administered by the Technology Dames of which she was the founder and advisor. Gifts may be made payable to the M.I.T. Eleanor Jack Fund and mailed to Mr. Watriss, Room 4-110, M.I.T., Cambridge, Mass. 02139. . . . Frannie and **Jim Donovan** were host and hostess at a "Pops" concert with Jack

and Jan **Chamberlain** among the guests. Their (the C's) weekends spent at their delightful Duxbury home seem to produce a good balance for the busy weekdays in Cambridge, for they are both looking tip-top. I'm taking off tomorrow to do some grandmothering for my new little granddaughter, Jennifer Susan DeMelle, down in Fanwood, N.J. Tonight I must do some homework, boning up on the latest techniques advocated by Dr. Spock. Debbie called me today from the hospital to tell me that the baby had gotten a 10 rating on the Apgar Rating. It seems that as soon as they are born now the doctors in attendance examine and rate them with 10 as the ultimate. Of course she will be coming home Sunday in "cap and gown" but I'm not sure about the diploma! (It's certainly a good time we graduated when we did!)

A note from our class agent, **Charlie Worthen**, states briefly but cheerily that his new address effective December 1, 1966, will be West Main Rd., Little Compton, R.I. 02837. He tells Jim Donovan that he will still be available for odd class jobs, because Little Compton is really not far away. . . . Charlie forwards to me a note from **Ted Pierce** of 108 Cranford Place, Teaneck, N.J.: "I am enclosing a write-up of one of our classmate's death. I hate to think that every time I write it is to bear bad news. If the notice of Don Kennedy's death has not appeared in the Tech news, will you kindly pass this on to them. On a little brighter plane my daughter Linda got married to James Pirretti on October 16, 1966. He recently passed his bar exams in New Jersey. Naturally we are very happy and proud of both even though we are now left alone with only the cats the girls have raised over the years. My older girl has an apartment a few miles from us and works in New York at McGraw-Hill Company. Hope you and your family are in good health and that we will see you in the near future."

Donald S. Kennedy died on June 5, 1966, in Chappaqua, N.Y., at the age of 61. We have a rather long obituary that we would like to print in the next issue of Tech news. . . . We also regretfully report the death of **H. Bowen Smith**, 6-A, of Reedsburg, Wis., who died on January 30, 1966.—**Hermon S. Swartz**, Construction Publishing Company, Inc., 27 Muzzey St., Lexington, Mass. 02173

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For the past several months current news has been coming in from various sources to your grateful Secretary so the questionnaire summaries were temporarily set aside. Believe we had started a rundown on classmates residing in Massachusetts which we will now resume. We should point out, however, that most of the questionnaires were returned in 1964 (over two years ago) so we may not be quite up to date on all the facts, but we do have some interesting stories from the Massachusetts group. . . . **William Whiting** of West Hanover is a special hazard engineer, New England Insurance Rating Associa-

tion in Boston. He sent us a nice resumé from which we quote: "Four years of philosophy and the understanding of what this point in time and space means makes it easier to put in 11 lines what you want to know. I am married to the girl who is still as exciting and even dearer than she was at Junior Prom. My work as a fire protection engineer has always been absorbing but is even more so with modern industrial methods. Our health is good and we are too doggoned busy to turn around. Those are the salient points after 35 years of happiness, work, sorrow, and all the other problems we each of us face at one time or another. I forgot to include our friends who help to keep us busy and happy." Bill's interests include photography, modern art, philosophy, church work and scouting. He also sent us news of **Lincoln Reid** now in Hingham, who is a hydraulic engineer with U.S. in Watertown. . . . Gloucester is the address of **Arthur Bearse**, who tells us little of himself (a design engineer for Sylvania in Danvers) but much of others. Arthur has contact with **Leo Goldstein**, who teaches school in New York and spends most summers in Europe; **Putnam Cilley** of Sharon who works for Jackson & Moreland and was in Santo Domingo at the time; and **Russell Clark**, still with Ling Temco in Dallas. Thanks, Arthur, for keeping us posted on our far-flung classmates. . . . **Kenneth Beardsley** of Dalton lists music as one of his hobbies. Ken played the organ at his son Bruce's wedding while the bride's father played the cello. Ken is a development engineer, magnetic materials, Distribution Transformer Department, General Electric Company. His work included lightning studies, transformers, and has specialized in transformer cores and core steel. His work has involved trips to various GE plants throughout U.S. and Mexico City. . . . **Jacob Mark**, Vice-president, research and development, of Dewey & Almy Chemical Division, W. R. Grace & Company, says he is saving his hobbies for retirement—right now he is too busy with his myriad church activities! Jacob's son Roger graduated from M.I.T. with a Ph.D. in electrical engineering. Also working in research and development is **Augustine Colarusso** of Boston who is currently employed by Van Brode Milling Company in Clinton as vice-president, R & D. He had formerly worked for the W. K. Kellogg Company in production research. He is a member of the Cereal Institute, Research Associates (Armed Forces) and Civil Defense. Also from Boston we heard from **John Osborn**, who is a self-employed operating consultant. He was president and chief operating officer of Forbes Lithography Manufacturing Company from 1950 to 1960. He lists his hobbies as many and varied—all in connection with family, children and grandchildren which include four daughters and eight grandchildren. We are sure his girls consult with John often. . . . **Edwin Perkins**, a retired Lt. colonel in the Air Force, is a member of Bell Telephone Laboratories, Inc., technical staff, and lives in Andover. His hobbies include sailing, Boy Scouts, Masons. . . . Also from Andover is **Walter Partridge**, Chief Engi-

neer of the B. B. Chemical Division of United Shoe Machinery Corporation. Walter spends his leisure time sailing and playing tennis, church activities, and is a member of the Professional Engineering Society. . . . **Charles Allen** reports that he and his wife Edith are now in Cambridge. . . . Mary Mead informed us of the death of Clara Farmer in October in Waban, Mass. Our deepest sympathy is extended to her husband, **Edward Farmer**, who is president of Farmer Electric Products Company in Natick. Their son, John Martin, graduated from M.I.T. in 1955. . . . From the alumni register we have word of the death of **Leonard Lawrence** on September 26, 1966. Leonard resided in East Greenwich, Rhode Island. . . . And, as another year begins, we are a year closer to our 40th Reunion in 1969, and the Reunion Gift Committee reminds us the 1929 class goal is \$625,000. Hope 1967 is a good year for all of you. Regards.—**John P. Rich**, Secretary, P.O. Box 503, Nashua, N.H. 03060

'30

This month there are information forms in from **Cecil Dunn**, **Tom Emery** and **Leslie Engler**. As many of you know, Cecil is an associate professor in the Department of Nutrition and Food Science at M.I.T. He teaches industrial microbiology and is also graduate registration officer and admissions officer for the department. His daughter Elizabeth graduated from Bates and is now married and has three children. Both Cecil's son Ronald and Elizabeth's husband are at University of Arizona. Cecil recently retired with the rank of colonel as commanding officer of the 1001st Army Res. Research and Development Training Group. He has also been active in the Boston Bacteriological Club and the New England Branch of American Society of Microbiology. . . . The information on Tom's form is a bit terse, but reveals that he is a self-employed accountant living in Royal Oak and working in Southfield, Mich. His daughter Mary graduated from Chamberlain School in Boston and is now married and has a son. . . . Les Engler is Dean of Administration at the City College of the City University of N.Y. He represented CCNY at the inauguration of M.I.T.'s new president in October, but was unable to find any classmate that he recognized. Les is a director of the local (Tenafly) Civic and Welfare Association and is now giving up tennis for golf, the latter of which he started playing last summer. He has two sons who graduated from Notre Dame and a daughter who graduated from the University of Toronto. Older son John is studying for a Ph.D. at University of Munich and younger son Robert is working for a Ph.D. at Notre Dame. Daughter Ellen is a Peace Corps Volunteer in Thailand. . . . **H. H. Scott, Inc.**, is celebrating its 20th anniversary this year. The history of the company and Scotty's personal contributions to the audio industry are reviewed in an article that appeared in *Audio Times*. Ordinarily I try

to avoid extended quotes, but I'm afraid that a chemist's effort to paraphrase Scotty's impressive technological record would leave considerable to be desired. Hence it seems best to rely on the language of the article. After commenting on the fact that Scotty holds more than 100 patents for original research, the *Audio Times* article goes on to say: "His achievements date back to his student days at M.I.T., where he developed the circuit that sweeps a beam across a television screen—an invention that made modern TV possible. Scott's engineering talent and insistence on quality helped him guide his firm to many firsts in the industry. One of his company's first products was a broadcast-model dynamic noise suppressor for radio stations which helped pave the way for the development of a commercial dynamic noise suppressor amplifier which became a complete high fidelity amplifier. Other Scott innovations included the development of the first successful commercial wide-band FM tuner in 1954. (This Scott development predated by seven years the introduction of multiplex stereo, which made wide-band circuitry necessary for all FM stereo tuners.) When the multiplex method of transmitting stereo by FM was finally introduced and approved by the FCC in 1961, Scott was the first to market a stereo tuner. In 1963 the company began manufacturing stereo consoles. Scott's most recent innovation is the development of field effect transistor circuitry for both FM and AM tuner front ends. This significant advance, incorporated in most of the firm's various products, helps eliminate cross modulation and drift, thus making it possible to hear more stations more clearly." . . . **Lawrence Anderson** recently acted as a member of a jury that selected the recipients of a series of architectural awards sponsored by the American Institute of Steel Construction. The winning entries, selected on the basis of their outstanding esthetic design, comprised an industrial plant, a civic center, an insurance building, a stadium and three banks. . . . **Earl Bennett**, who is manager of architectural sales for the Koppers Company, was recently elected president of the Producers' Council. . . . Changes of address: **Dr. Bernard Canter**, 663 State St., Springfield, Mass. 01109; **Peter S. Kallelis**, 112 Lefferts Rd., Garden City, N.J. 11535; **David P. McIntire**, U. S. Pipe & Foundry Company, 3300 First Ave. North, Birmingham, Ala. 35202; **Morell Marean**, 129 Front St., Marblehead, Mass. 01945; **Warren H. Martell**, 905 E. Ocean Blvd., Long Beach, Calif. 90802; **Joseph C. Twinem**, 313 Prospect St., Cripple Creek, Colo. 80813; **Dr. George P. Wadsworth**, 230 Waltham St., Lexington, Mass. 02173.—**Gordon K. Lister**, Secretary, 530 Fifth Avenue, New York, N.Y. 10036

Monday, June 12. When you receive our reunion mailing, please let us know by returning the tear-off that there is some possibility that you will be able to attend this year. Any other suggestions, offers of assistance, or questions will be welcomed by your committee. . . . **Charles Chapman** writes that after 17 years in Florida he has transferred to the Richmond, Va., main office of his company, the Mobil Chemical Company, a division of Mobil Oil Corporation. He will now be handling technical services for the Agriculture Chemicals Division and expects to do a great deal of domestic and foreign travel. His address is now 2000 Riverside Drive, Apt. 55, Richmond, Va. . . . **James J. Robson** is now working for the Bechtel Corporation in San Francisco. He is with the Mining and Metals Division. He lives at 260 Mapache Drive, Portola Valley, Calif., and writes that he often sees **Rolf Eliassen**. . . . His active interest in the history of science has taken Dr. **Sidney M. Edelstein**, who is president of the Dexter Chemical Corporation, into the history of color. He related to the American Chemical Society at a meeting in Michigan his experiences in analyzing dyed textiles preserved for 20 centuries in the area of the Dead Sea and the religious and anthropological implications of his results. . . . **Harold G. Mangelsdorf** has been appointed member of the Advisory Committee on Reactor Safeguards of the Atomic Energy Commission. Harold retired in 1966 as president and director of the Esso Chemical Company, subsidiary of the Standard Oil Company (New Jersey) after a career of 30 years in the technology, operation, and management of high temperature petroleum and petrochemical plants. His home is in Short Hills, N.J. . . . **Richard M. Stewart**, President of the Anaconda American Brass Company of Waterbury, Conn., was re-elected chairman of the Board of Trustees of the Connecticut Public Expenditures Council. In addition to a number of company directorships he serves as director of the Naugatuck Valley Industrial Council and trustee of the Westover School.—**Elwood W. Schafer**, Secretary, Room 13-2145, M.I.T., Cambridge, Mass.

am greatly interested in the dedicated man who has given up a lucrative profession to teach full time. Also, I am interested in the man who teaches nights, after putting in a full day of work, no matter what his motives may be. And in order to complete a very desirable list, we must have the names of those who appear in these columns once in a while who teach as a regular profession, men like **Athelstan Spilhaus**. I am more than sincere in asking for names and facts for this list, and would welcome information on teacher classmates sent in to me by anyone. Now, if Cal will excuse my apparent digression, I also think that it would be great to have a list of men and women in the public service, those serving the public direct and those who serve their various professions, which in turn serve the public. We surely must have a few politicians, big and small. . . . Cal plans to be in Houston for the annual meeting of the AIChE sometime in February and asked for a list of those who reside in that area. He got the list, and if I know Cal he will call them. The list includes **Mortimer P. Williams**, from LaPorte; **William D. Harper** from Seabrook, as is **Sam P. Robinson**; **Robert Dillon** and **Winfield Partridge** from Texas City and environs; **George Rabson**, **Felix A. Vogel** and **Duke Selig**, all from Houston. . . . Cal compliments **Jim Turner** on the fine job he did on the Kimball Fund. . . . To **Lou Flanders**, send Cal your new home address, and while you are at it send me a copy. . . . Thanks, Cal, and keep up the constant flow of material for the mill. You know that I appreciate the work you put into it, and you may not know that many of your classmates also appreciate it. One of them even asked me why not Cal for Secretary. I called it a good question, and also say, "Why not!"

Now comes a true friend, **Mal Masters** of Winchester, Mass. He has now checked and discovered that a young Harvard man, Donald H. Regan of Kingsport, Tenn., is none other than the son of **Andy Regan**, an old Course VIer, and has been awarded a Rhodes Scholarship. We must concede that this young fellow has turned out to be a very bright one indeed. Mal checked this story out through Joe Regan who is a brother of Andy, and who is a vice-president of Boston Edison in charge of industrial relations. . . . I appreciate a chance to spread the good word about the son of another one of us who has done a good job. We all can take a lot of pride in the accomplishments of sons of our classmates, and why not? I just read Mal's nice letter over again and it reminded me that I had not only missed something, but something real important. Son Stan is a Ph.D. from Princeton, 1965, in economics. He became affiliated with Brookings Institute of Washington, D.C. soon after Princeton and is in research work with them. He married the former Julie Jones of Springfield, Ohio, in July. The young couple is living in Rockville, Md. Now I must quote or I will lose a little. "I [Mal] am active with the Appalachian Mountain Club, both in hiking and in canoeing. In fact Claire and I were in charge of the fall hiking week of the Club at Eastern Slope Inn, North Conway, this fall." Mal does not mention skiing, but it is safe to

'33

So now we moan about the dearth of material from which to write these lines. Always, this is the bad time for Ye Scribe. I had stuff in the file in July which would not appear in print until November, but now the cupboard is bare. The reliable **Cal Mohr** fills a part of the breach. So, we are off again, and until you see a new paragraph the story is all from Cal. **Jim Vicary** is teaching two courses in business management this fall at the Penn. State University Center in Erie. These courses are given both to the day and night students. And now Cal asks if anyone has compiled a list of our classmates who teach either full or part time. The answer from here is no. Anyone who is doing any teaching whatever please send in the story, and I will make up and have published the complete story. I, personally,

'32

The 35th Reunion of the class of '32 will be held June 9, 10, 11, 1967, at the New Ocean House, Swampscott, Mass. Alumni Day on the M.I.T. campus will follow on

assume that he gets into that too. He is chairman of the Winchester Conservation Commission. Mal recalls a happenstance of just about a year ago, the big blackout of 1965. As superintendent of operations at Boston Edison Mal had charge of "putting the pieces back together again."

Now comes once more **L. W. Moore** (Bill) making a speech in Chicago September 12, 1966. We have before us two items on Bill, first the press release and second the speech of the evening before the 13th Annual Petroleum Industry Conference, The Institute of Electrical and Electronic Engineers, held at the Sheraton-Chicago Hotel. For those who came in late, Bill is president of the American Oil Company. It is a fine, thoughtful speech and deserves to be quoted in its entirety, but obviously this is not possible. Basically Bill speaks on a present national attitude found in most of our business men, and also most of our younger generation. He started out to talk about the future of the oil industry, but quite purposely veered off into a deeper subject, in what he calls his speech number two, where he says, "My concern is with the need to achieve appreciation among all Americans of the vital contribution that our economic system has made to the progress of mankind . . . I refer . . . to the need for realization that there can be no effective alliance between our social conscience and an empty purse." He goes on to quote John W. Gardner, known to us all. "It is hard for Americans to realize that the survival of the idea for which this nation stands is not inevitable. It may survive, and I repeat, may survive only if enough Americans care enough." Bill adds himself, "It would be easier for us to grasp this truth if we were not so blessedly comfortable." To paraphrase, the results of many polls have prompted many prominent Americans to comment on the widespread and shocking ignorance of economics, even among those college students, whose opportunity to understand is apparent. Bill goes on to quote some figures from these polls, 40% of the visitors to the Hall of Free Enterprise at the N.Y. World's Fair could not name a single advantage of capitalism over communism, 61% of today's students consider the profit motive unnecessary to our socio-economic system, 86% believe that there is no competition in business, 34% think that consumers have little effect on prices, 60% of these students think that the government should take over a substantial part of the nation's business. Again a quote is indicated, "Half or more of our college seniors regard business as financially rewarding and competitive, but only 20% consider such careers as challenging, and only 11% believe them to be creative, only 7% find business intellectually stimulating, and only 1% believe that, in business, one has a chance to help others. Perhaps all this explains in part where Bill laments the attraction of college grads to careers that appear to offer strong personal involvement in the achievement of social and cultural goals, such as welfare work, the Peace Corps; and their utter disdain for business careers. We charge these students with seeking a life of ease, and with having little stomach for competitive

challenges." Bill goes on to offer the idea that it is not wholly, or even greatly, the fault of these individuals just discussed when proponents of our present socio-economic system are doing something less than can be done. Too few of our nation's business and industrial leaders are recognizing their obligation to act effectively to insure the survival of the political-economic system which makes it possible for our businesses to exist at all. And he submits that a great many have not given enough thought to the problem to offer an adequate defense even if they were so moved.

May I now refer to a letter from Armando Santacruz B., publicity man for the Mexico City M.I.T. Fiesta for 1967. He says that the 7th Annual World Petroleum Congress, which takes place also in March 1967 in Mexico City, probably will be attended by upwards of 7000 people, and that it is advisable that any reader of these notes make reservations well in advance. To add our nickles worth, March is a busy month in Mexico City, and if this big Congress and the Fiesta run reasonably consecutively, many will make an effort to attend both. Now further, he sent me ten xerox copies of the Fiesta program, so if anyone is interested, I will be only too glad to send him a copy. I will have more of the final printed programs if there is a demand for more than the ten. We have told the story of this great event several times before, but it cannot harm to repeat. This M.I.T. Club is a bunch of livewires in our neighbor country to the south. This Fiesta coming up in March (9 to 12) is the 19th annual such meeting, and though mostly social and sightseeing, it is an M.I.T. function good enough to have attracted Dr. Stratton last year with Mrs. Stratton. The announcement is not only a program, but the bottom half is an application for reservations. Some classes have used this event as an off-year reunion meeting place, and surely there is merit in this. . . . **Henry Kiley** from N.J. with a plaintive note, and very philosophical, "Nothing ever happens to any note; nothing exciting, and no triumphs to report. What a drab existence!!" Henry seems not to realize that he is taking part in the passing parade in which we all find ourselves. Henry, by the way, used to be an M.I.T. teacher but apparently thought better of it, as I gather that he is not now in teaching. He gets honorable mention on our list of dedicated men and women who teach part or full time. Henry has his calendar marked for the 35th come one year from next June and says that he will surely be there if his son Kevin's commencement does not conflict. I have already told Henry that commencement exercises take up but a small part of any one day so he can take in the rest of the Reunion with ease. And it is only 1½ hours from Chatham to Medford (Tufts) these days so he could lose only 4-5 hours. Now comes a word via the press from **Siebert Quimby Duntley**, one of our more distinguished Ph.D.'s from California. The article is a bit sketchy, but it appears that Quimby stayed at the Institute until 1952, at which time he received his Doctors. He then went with the Scripps Institution of

Oceanography at University of California at San Diego where he now serves as director of the Visibility Laboratory. His main interests are human vision capability and environment optics. Quimby has just been elected as president of the Optical Society of America, and it appears that he has been president before. He was awarded the Frederic E. Ives Medal by the Optical Society of America in 1961.

We have but few address changes this time around: Doctor **Gordon C. Pratt**, **Harper V. Richards**, and **Harold W. Russell**, Courses VII, IV, and II respectively. We will be pleased to furnish the new address to any who request it. I have one small request to make. I have just turned up another case of a classmate who is on our address list with an original home address, then a business address, then over again, making three changes without any apparent address change at all. This sort of thing is not the least bit hard on me, but it is a case of the Alumni Office having to spend time on something that is completely unnecessary. It takes their time, and is costly. Please send in only legitimate address changes, with zip number, of course. . . . That's it for the brand new month of January 1967 in a brand new year. In haste to get the December notes in on time I neglected to mention Christmas greetings, so you will have to take them as implied. However, happy New Year, to each and all.—**Warren J. Henderson**, Secretary, Fort Rock Farm, Exeter, N.H. 03833

'34

During my annual trek to Cape Cod last fall I looked in on Snow Inn in Harwich Port. It is still there, and very inviting. As **Carl Wilson** mentioned in his annual letter to all class members, start preparing now for our 35th Reunion in 1969 at Snow Inn. . . . In September I saw **Bill Baker** and caught up on his activities. I visited him in the Boston Marine Society headquarters where he is busy compiling the history of that old and honored organization. He had the first four chapters written at that time and even crusty old sea captains have enjoyed the results so far. The history will not be a dry journal of historical dates, memberships and dues paying members, but a real story of the development of marine installations and events of the times along the Massachusetts coast. For instance I was privileged to see the original handwritten petition to Congress for a permanent lighthouse on Cape Cod in 1796. A year later the petition was granted and Highland Light (now known as Cape Cod Light) became the first lighthouse along the Massachusetts coast. Bill's history is scheduled for completion by July, 1967. Along with this endeavor Bill and his wife Ruth have been spending three and four day weekends in Bath, Maine, where Bill is also compiling the history of the Marine Research Society of Bath. This is another Herculean effort scheduled for completion by February 1970. In addition to all this Bill spends two days a week at M.I.T. as curator of the Francis Russell Hart Nautical Mu-

seum, and continues to be bassoonist in the Hingham (Mass.) Civic Symphony Orchestra along with Jerry Stein, Larry's charming frau. . . . Speaking of **Larry** and **Jerry Stein**, I understand that they spent the past summer in England, he on business and she sightseeing. Larry states that July 4th in England was very dull, but he enjoyed working with British engineers concerning ceramic insulators which are being produced for Larry's company, Sigma Instruments, Braintree, Mass. . . . I had a fine letter recently from Professor **Henry N. Andrews** ("Ernie" to us classmates). He is head of the Botany Department at the University of Connecticut. Ernie states that during last summer he had the pleasure of receiving the "Merit Award" of the Botanical Society of America. Two or three of these awards are given each year "In recognition of distinguished achievement in and contributions to the advancement of botanical science." Ernie is still mountain climbing on occasion. I cannot say that I am that limber any more, but would like to try it again. . . . **David D. Knox** has recently taken the post of the first full-time engineer of the town of Waterford, Conn., where he will deal mostly with road construction and maintenance. Previous to this appointment Dave was highway superintendent in Stonington, Conn. —**W. Olmstead Wright**, Secretary, 1003 Howard Street, Wheaton, Ill.; **Kendrick H. Lippett**, 8735 Delgany Avenue, Apartment 211, Playa Del Rey, Calif. 90291; **James P. Eder**, 1 Lockwood Road, Riverside, Conn.; **Norman B. Krim**, 15 Fox Lane, Newton Centre, Mass. 02159

'35

I had expected that by press time for this issue of the *Review* I would have had a flood of letters from you as a result of President Mowatt's and Agent Beckwith's letters asking you to write to me. I am sorry to report that I have a grand total of one from John Taplin, besides notes from Allan and Leo. It is, of course, too soon to expect results from my November and December class notes, since as of this moment the November *Review* has not reached me nor you, I assume. I am hopeful that you will have changed this picture by the time the deadline for February notes arrives. . . . In a friendly note, **Leo Beckwith** reported spending a short visit with my daughter, Merrilyn, when he and his daughter, Lois, visited Oberlin College recently. Oberlin is high on Lois' college choices, so she may become a college mate of Merrilyn's next year. . . . **John Taplin** reports that, while remaining associated with the Bellofram Corporation of Burlington, Mass., a firm he started that manufactures industrial diaphragms, he spends most of his time in general consulting and development work. **Allan Mowatt** adds that John spends more time in civic affairs also, being chairman of the 1966 United Fund Drive in Newton. John and his family have resided in Newton-15 Sewall St., West Newton, Mass. 02165—for the last 21 years. His family includes a married daughter resid-

ing in Boston, a daughter attending Beloit College, a son at Bellofram Corporation, a daughter in hospital work, and a son in Newton High School. . . . The only other bit of news to report is from Allan Mowatt who saw **Dick Jarrell** of Jarrell-Ash Corporation and **Forrest Goldsmith** of BTU Engineering Corporation at the New England Research Engineering Meeting and Exhibition in Boston. It seems that a note from Dick and Forrest should be forthcoming. How about it fellows?—**Hamilton H. Dow**, Apt. P-550, Devon-Strafford Apts., Devon, Pa. 19333, Co-secretary; Regional Secretaries: **Arthur C. Marquardt, Jr.**, 178 Vernon St., Dedham, Mass. 02026; **John H. Colby**, Rt. No. 1, Box 91A, Islamorada, Fla. 33036; and **Edward Loewenstein**, 444 Cornwallis Drive, Greensboro, N.C. 27408

'36

Greetings for 1967 to you all! **Walt Mac-Adam** is going to have a busy year as president of the Institute of Electrical and Electronic Engineers in addition to his responsibilities as a vice-president, government communications, for the American Telephone and Telegraph Company. Recently I discovered misfiled (shall I fire my secretary?) letters from classmates who were unable to attend the reunion in person but were with us in spirit. **Cesar Calderon** writes from Puerto Rico: "I am currently engaged in putting the finishing touches on a dairy project which calls for the feed lot feeding of 1000 milking cows on an acre of concrete, with an adjacent concentrate feed plant with all the feed mechanically transported to the cows. We expect a daily production of from 15 to 20 thousand quarts. No grazing is contemplated. On this farm which is about 500 acres we also have a sugar cane operation and we have built a prefabricated country house, a Tech-built. We have a 200 acre lake adjacent to the farm where we keep a 19' speed boat which we use for cruising and fishing. I had always wanted to satisfy my curiosity about farming and I guess this is it. The main raw materials for the feed will be sugar cane bagasse and molasses, which are locally available." Cesar also reports that he is no longer president of the Payco Ice Cream Company but is chairman of the Board, and he enclosed some pictures of his operation. . . . **Al Bagnulo** reports from Cape Kennedy that he is assistant center director for engineering and development at the JFK Space Center. He is responsible for the design and construction of facilities and ground support equipment required for launch of NASA's manned and unmanned space vehicles at the center. When the astronauts take off for the moon we can take pride in the fact that Al is "pushing" from behind. There was also a letter from **Dick Denton** who was able to make Alumni Day but not the weekend. The eldest Denton daughter had just returned from service in the Peace Corps in Malaya and was starting with Bell Labs as a technical librarian. A second daughter was expecting to be sent to Peru for the

AID branch of the State Department and their son Peter is a senior at M.I.T. In 1964 Dick and Virginia started Denton Vacuum which makes many types of high vacuum equipment and accessories most of which go into the research laboratory, but many are used in production of transistors, diodes and micro-circuits as well as optical films of all types. "We make an electron beam gun which can be used to vaporize anything and at one time advertised this as 'the fastest gun in the East'." The Dentons are living at Bradock's Mill Lake in Marlton, N. J.—in case you're down that way.

As always I have some addresses to report: **Donald McCluskey** is at 1684 Mott-Smith Drive in Honolulu 96822; **Fred Prahl**'s new address is Monmouth Hills, Highlands, N. J. 07732. Dr. **Ed Pratt** is with the Children's Hospital Research Foundation in Cincinnati 45229; and **Elwood Koontz**' address is 2612 Guilford Road, Cleveland Heights, Ohio 44118. I regret to report that **William R. Stuckey** died on February 6, 1966, and **Maro F. Hammond** of North Edgecomb, Maine on June 6, 1966.

The Alumni Association is planning to list activities of former graduate students under course rather than class designations—a process which certainly makes sense to me. When the system is in complete operation I will no longer be reporting news of graduate members, but until that time these notes are the channel of communication. **Victor Gilbertson** has been made a fellow of the American Institute of Architects. He is a past president of the Minnesota Society of architects. Captain **Robert L. Evans** is living on Washington Street in Duxbury, Mass. 02332; and **Orrington Dwyer**'s address is R.D. 1 Wading River, New York 11792. . . . The new year finds the Kimballs well scattered. Our oldest daughter and her husband are teaching freshman chemistry at the Middle East Technical University in Ankara, Turkey; our son, Tom, is on his way to Thailand for the Air Force; daughter number two was married in November and is living and working in Chicago. Our youngest daughter is a sophomore chemistry major at Carnegie University (formerly Carnegie Tech). George and I are as busy as ever and will welcome hearing from any of you who are by this way or can pick up a pen and write.—**Alice H. Kimball**, Secretary, 20 Everett Avenue, Winchester, Mass. 01890

'37

Dick Young, our reunion chairman, announces that plans are well underway for our 30th Reunion this June at the Oyster Harbors Club. Mark the dates—June 10 to 12—on your calendar pad and make a New Year's Resolution to attend. Remember our 25th reunion and I am sure you won't want to miss the 30th. **Bill Bakarian**, **George Randall**, **Joe Sousa**, **George DeArment** and **John Robbins** are the latest to join the list of those planning to attend. . . . **Dave Summerfield**'s son Steve has completed 4 years in S.A.C. of

the Air Force and is now studying electronics at the University of Illinois. His son Gary, 21, is now a senior at University of Tulsa, Okla. and plans to go on for a law degree. **Joe Sousa** is chief engineer of Safety Electrical Equipment Corporation, Hamden, Conn. **Jack Simpson** had two holes in one while playing golf last summer. **Bill Bakarian** is president of P. William Bakarian and Associates, Inc., of New York City. **George DeArment** is president of Channalock, Inc. He is director for Northwest Pennsylvania Bank and Trust and Medeville Telephone Company and Pennsylvania State Chamber of Commerce. George writes that he is still involved with the Country Club as director and Greens Committee chairman. **Ralph Chapin** writes that he and his wife Sanna spent some weeks in the Far East during the last two years. They were in Saigon in February '65 for a few days and this spring, with some considerable effort, obtained permits that allowed them to visit Sikkim. **George Randall**'s son Gar (G-A-R, Jr.) graduated from M.I.T. in June in chemical engineering. He is now employed by Sinclair Research, Inc., in Harvey, Ill.—**Robert H. Thorson**, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Professor **Curtiss Powell**, Assistant Secretary, Rm. 5-325, M.I.T. Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

'39

How many thirty-niners noticed the *Time* (November 4) article on Caltech and M.I.T., "Rivalry Between the Best?" Physicist **Richard P. Feynman**, VIII, was mentioned twice in the article. At Caltech Dick "... is helping to unify the theories of gravitational and electrodynamic fields ... and to help freshmen adjust to the difficulties of college studies compared to their high school A's." He also "... tries to ease the pain by wryly reminding freshmen that inevitably 'half of everyone of Caltech's classes is below the class average'." Incidentally, Dick reaches the national news frequently, and as a result has been written up in this column five times since 1964! ... Peripatetic **Harold R. Seykota**, XV, has relocated from Holland to Peru. Hal is currently general manager of Quina, a corporation which will build in Peru a large fertilizer plant having the capacity to produce 600 TPD of ammonia and 450 TPD of urea. Home base for the Seykotas is 3818 Montrose Circle, Jackson, Miss. Hal wrote from Lima, Peru, where he was staying at the Gran Hotel Bolivar and where he had experienced the October earthquake that caused over one hundred deaths and loss of homes to tens of thousands. "At 4:44 p.m. for 45 to 55 seconds, which seemed to me like a lifetime, we were shaken in all directions in the sixth floor of the office building." Apart from the earthquake, Hal continued: "Last week I met **Chris Rosas**, X, (listed in the Alumni Directory as Juan C. Rosas Figueroa, Jr.) and his charming wife, again here in Peru. You may remember he has several whaling fleets and whale oil and fishmeal plants.

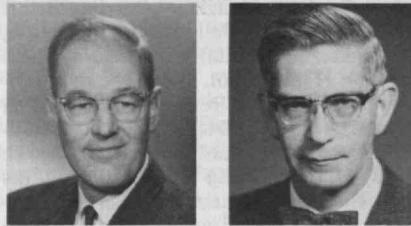


PHOTO: U.S. NAVY

Edwards R. Fish, James H. Schulman, '39

He is a most gracious host." Thank you, Hal, for that good letter. . . . **Frank B. Gorman**, XVI, Director of Planning of CBS Laboratories, Stamford, Conn., is supervising the initial phases of a new research group investigating the growing field of oceanography. Frank retired from the U. S. Navy a few years ago with the rank of Captain after a long and distinguished scientific and technological career. Prior to joining CBS Laboratories, he was director for plans and advanced technology at the Secretary of the Air Force Special Projects Office at El Segundo, Calif. . . . **Edwards R. Fish**, XV, controller of the Seattle-based actuarial firm of Miller & Robertson, Inc., has been elected secretary of that nationwide corporation, the second largest actuarial consulting firm in the country. Ed moved to Seattle in 1939, and has performed cost accounting, financial, and engineering planning duties there for several major corporations, including Boeing during World War II. As an amateur writer-historian, he recently completed a one-man research project documenting Issaquah's 100-year-old history in a unique collection of pictures and stories. . . . **Dr. James H. Schulman**, V-grad, newly appointed superintendent of the Naval Research Laboratory's Optical Physics Division (November '66 notes), presented the opening paper in Vienna, Austria, at a Symposium of Solid-State and Chemical Radiation Dosimetry in Medicine and Biology, sponsored by the International Atomic Energy Agency. His topic: "Principles of Solid-State Luminescence Dosimetry."—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

'40

Fluid Dynamics, of which **Joe Wiley** is President, had a reception and cocktail party at their plant in Morristown, N.J., on November 17, 1966. . . . **Bonner Hoffmann** is the new vice-president of Geuder, Paeschke & Frey Company, Milwaukee metal fabricating and steel container manufacturer.

It is with regret that I must report the death of three classmates. Professor **John Devine**, who was with us for one term in his graduate year, died on March 10, 1966. . . . **George Schneller**, who also was associated with our class, died on August 12, 1966. He had been working at Alliance Steel Products, Inc., in Alliance, Ohio, at the time of his death. . . . **James Dinsdale** died on August 28, 1966. He had resided in Cornelius, Ore. I do not have any

further details in regard to these classmates but would appreciate it if any classmate having information would write me for publication in a future column.—**Alvin Guttag**, Secretary, Cushman, Darby & Cushman, American Security Building, Washington, D.C. 20005

'41

Zachary P. Abuza, at the request of M.I.T., represented M.I.T. at the inauguration of Mr. Groves at Central State University on October 20, 1966. . . . **Henry Pohndorf** is in the news as having developed a highly specialized and intricate mechanical respirator to stimulate the working of the human respiratory system. The device known as the Bird respirator has supplemented and in some cases, replaced traditional oxygen therapy equipment in hospitals to assist or control breathing for asthma, cystic fibrosis, emphysema, respiratory acidosis, polio and other patients with respiratory and chest problems. It is particularly suitable for use in geriatric cases and in infant tracheotomies. The unit delivers nebulized medications and air or oxygen directly to the lungs under positive pressure to conform to lung functions during both inspiration and expiration. The unit is made by the Bird Corporation of which Henry is vice-president and mechanical engineer. . . . **Kenneth G. McKay** has been made vice-president of engineering for American Telephone and Telegraph Company. He assumed the post as of December 1, 1966. He joined the Bell Labs in 1946 and undertook fundamental research studies of the physics of solids, including studies of secondary electron emission and electron bombardment conductivity in insulators and semiconductors. Subsequently his work related to the electrical and optical characteristics of electrical breakdown in germanium and silicon. He has for seven years been executive vice-president for systems engineering at Bell Telephone Laboratories. He is a fellow of the Institute of Electrical and Electronics Engineers and of the American Physical Society and has served on the board of directors of the *Physical Review*. He is a member of the Research Society of America. . . . **Harlan E. McClure**, formerly a professor in the School of Architecture in the University of Minnesota, is dean of architecture in Clemson University in South Carolina. He obtained a liberal arts degree from George Washington University and also holds a B.Arch. from there. He obtained a degree in architecture and city planning from the Royal Swedish Academy in Stockholm and his M.Arch. from M.I.T. He was awarded his FAIA for distinction in design and education. Among other honors are a Fulbright Fellowship to the United Kingdom. In the AIA he served the Minneapolis Chapter as a director and as secretary, was president of the Association of Collegiate Schools of Architecture, director of the National Council of Arts in Education and is secretary-elect of the National Architectural Accrediting Board. In addition to being dean at Clemson, he is secre-

tary-treasurer of the Clemson Architectural Foundation. . . . **James M. Austin** is carried in Volume 47, Number 8 *Bulletin of the American Meteorological Society* as a certified consulting meteorologist since 1960. He is a professor in the Department of Meteorology at M.I.T.

Please address news items of Class '41 members to any one of the following—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass.; **Everett R. Ackerson**, Assistant Secretary, 16 Vernon Street, South Braintree, Mass.; **Michael Driscoll**, Assistant Secretary, City Hall, Nantucket, Mass.

'42

As you have been able to tell from the various mailings you have received, **Bob Rines**, Chairman of the 25th Reunion, is spending many hours in putting together a reunion which will be a milestone for each of us. The committee has had a number of meetings, and by the time these notes are published will have had a meeting in December, with the wives of the committee members attending to finalize the programming as far as possible, including plans for the youngsters, teenagers, college students, and post college children of our classmates. . . . **Lou Rosenblum's** subcommittee on the book has mailed out questionnaires which you all have received by now. These should be filled out promptly and returned. . . . The letterhead on the mailing contained the names of all those classmates on the committee, but since the letterhead was printed the following men have joined the various parts of the overall committee: **Joseph Altman**, **John Schmidt**, **R. W. Austin**, **John Whitman**, **Morton Goulder**, **Lou Arnold**, **Erwin Anisz** from Mexico, and **Charles Stempf** from Australia.—**John W. Sheetz**, 3d., Secretary, 45 Rutledge Rd., Belmont, Mass. 02178

'43

Joe Tancoos wrote in October: "I just had a frightening note which indicated that somehow or other despite the fact I have been having annual '38' birthday parties for years I seem to be involved with a group of characters who are going to have a 25th Reunion in 1968—I expect to be still 38 then. Your distinguished President suggested a note about activities. I am not much at this newsletter kind of business but I do pay—overpay—some public relations people, and I am enclosing a not particularly overly modest biography so you can have your records up to date. Among other things I run a fairly proper hotel—Delmonico's at Park Avenue and 59th Street—which does very well except we many times have vacant rooms. If you or any of our peripatetic classmates are without lodgings in New York the general manager is John Francis Isard—I stay away as much as possible—and he would be delighted to take personal care of any M.I.T. vagrants. You don't suppose we could have a 15 year reunion in 1968

do you?" Joe is senior partner of Tancoos & Company, specialists in consultant work in chain store properties and in the field of creation of property investments as realty brokers and investment advisors. He is also chairman of the Tancoos Yarmon group of 20 subsidiaries and affiliates which own or control more than \$100 million in property in the U. S., Canada and Britain. With Elliot N. Yarmon he formed Tancoos Yarmon Limited, with headquarters in Toronto in 1954 as an affiliate of Tancoos & Company. This company is now Canada's largest private realty investment firm. He also manages, jointly with Mr. Yarmon, Dollar Land Holdings Ltd., a major British publicly-owned realty investment firm, as well as its North American operating subsidiary, Dollar Land Corporation, Ltd. The two men have increased assets of the group by more than \$20 million to almost \$50 million in Canada and the U. S., with Mr. Tancoos looking after business in the United States and Mr. Yarmon acquisitions in Canada. Joe has offices in many cities of the world but maintains his head office at 635 Madison Avenue, New York, N.Y. He is also president of Delmonico's Hotel, New York City, and the Colony Hotel in Palm Beach, Fla., both of which he owns in partnership with Mr. Yarmon. Mr. Tancoos is director and president of Tancoos Yarmon Hotels Ltd., director, Florida Capital Corporation. He is Honorary Consul, Republic of Panama, a member of the Real Estate Board of New York, National Association of New York, West Side Association, Westchester Country Club, Coral Beach Club, Palm Beach, Canadian Club of New York, Wall Street Club, M.I.T. Club, Honorary Citizen of the State of Tennessee-Kentucky Colonel, Honor Member of L'Union Interprofessionnelle des Vins Du Beaujolais, winner of the Curnonsky Award by the Societe La Commanderie Des Cordon Bleus de France, member of Chevaliers du Taste-vin, and member of Lucullus Circle. . . . **David McKay**, of Los Angeles, Calif., wrote that he has three sons: David II, 9; Ted Alexander, 8; and Peter John, 6; and is, naturally, chairman of Cub Scout Pack 333 in South Pasadena. He is also active in the Braun Fishing Club, in the various chemical societies, and includes classical cars, fishing and golfing as his hobbies. . . . **William R. Thurston** was appointed vice-president for planning at General Radio Company in Massachusetts. Formerly marketing research manager, he was also named a member of the company's Management Committee. He joined General Radio in 1943 and for several years was manager of General Radio's New York Sales Engineering Office. He is a senior member of the Institute of Electrical and Electronics Engineers and a member of the American Management Association, American Marketing Association, and American Production and Inventory Control Society. . . . **Jim Spitz** was appointed executive vice-president of Tenneco Chemicals, Inc., a major component of Tenneco, Inc., formerly Tennessee Gas Transmission Company, Houston, Texas. His offices are in corporate headquarters at 300 East 42nd Street, New York. Jim joined Newport Industries, Inc.,

in 1946 as a chemical engineer after completing World War II service as a Naval officer; Newport Industries subsequently became part of Heyden Chemicals, Inc. in early 1965. He became president of Newport on January 1, 1961, and was appointed group vice-president of Tenneco Chemicals on July 1, 1965. Jim is a director of Tenneco Chemicals, Inc., and an officer and director of many of Tenneco's foreign subsidiaries. He is a member of the American Chemical Society, American Institute of Chemical Engineers, and Chemists' Club of New York. . . . **Fred A. Mudgett** has been elected a vice-president of the Hertz Corporation and also has been named general manager of Hertz International, Ltd. Hertz International, a subsidiary, conducts vehicle renting and leasing operations in 91 countries outside the United States. A veteran of the industry, he joined Hertz in 1946 and has held a variety of posts in operations and sales in domestic and international vehicle renting. In 1962 he was elected a vice-president of Hertz International, first directing advertising and sales activities and then operations. Born in Waukegan, Ill., Fred received a Bachelor of Arts degree from Knox College, Galesburg, Ill., and in 1943 a Master of Science from M.I.T. He served in the U. S. Air Force during World War II, rising to the rank of captain. . . . **Harrison E. Cramer** and **Frank A. Record**, who both received masters degrees with our class, have joined the GCA Technology Division of GCA Corporation as principal scientists in the Meteorological Department of the division's physics laboratory. . . . **Charles N. Satterfield**, a professor in chemical engineering at M.I.T. who received his masters with our class, was co-author of a paper on "Effectiveness Factor for Porous Catalysts" and a paper on "Effect of Geometry on Catalyst Effectiveness Factor," both of which appeared in a recent issue of *Industrial & Engineering Chemistry Fundamentals*. . . . I failed to report in an earlier issue that our class had a good turnout at the 7th Alumni Officers Conference at M.I.T. in September, including **Howard M. Bollinger, Jr.**, **James F. Hoey, Jr.**, **James O. McDonough**, **Gilbert P. Monet**, **Andrew W. Plonsky**, **Stanley M. Proctor**, **Barrett B. Russell**, 3d., **Kenneth R. Wadleigh**, **John E. Ward**, and yours truly. . . . **Ned Swanberg** held a meeting on December 1 of the 25th Reunion Gift Committee in Boston. We are slowly reaching our goal, but it appears that the last 18 months will require a great deal of effort.—**Richard M. Feingold**, Secretary, Ritter & Berman, Attorneys at Law, 266 Pearl Street, Hartford, Conn. 06103

'44

I hope that when you receive this issue of the *Review* you will have had a merry Christmas and that the new year will be going well for you. If you did not send in your Alumni Fund contribution by December 31 for the current fund year, keep in mind that you may soon fall off the circulation list for the *Review* if you made your contribution to the 1966 campaign

in calendar year 1965. If you last contributed between July and October 1965 I calculate that your subscription to the *Review* will expire with this issue. . . . As these notes are written in mid-November the first (November) issue of the *Review* has not yet appeared, so there is no opportunity for feedback from earlier columns. However, your secretariat is organizing to implement the practice of Howard L. Livingston, Secretary of the class of '51, who sends double postcards to class members when he learns of a change of address. If you have received such a card but have not responded by the time these notes reach you, please consider these words as a reminder to write. As a result of preparations at the Institute to publish a new alumni register, the change of address notices have increased from 10-15 per month to 50 for October. . . . From the August 1966 issue of the *Journal of the Electro-Mechanical Society* we learn that Dr. Mario D. Banus of the Lincoln Laboratory in Lexington, Mass., has been elected as vice-chairman of the Boston section of that society. . . . By courtesy of Robert J. Fay, '42, we learn that Edmund R. Jonash, 989 Cahoon Road, Westlake, Cleveland, Ohio, an engineer at the Lewis Research Center of NASA, was awarded the Exceptional Service Medal of NASA at ceremonies in Washington, D. C., on October 7. Ed is manager for the Centaur Project. He and his predecessor received the awards for their "outstanding service and significant contributions" leading to the development of the Atlas-Centaur launch vehicles which were used in NASA's moon shots. Congratulations, Ed. . . . Class President John Hull in a post card from Paris dated November 3 says, "Hi, Paul—Just a note to let you know we're still alive and kicking—but not complaining. Export business continues to boom even more than domestic business. Have not done anything more on our Reunion Gift activities since our September meeting in Boston but will get them rolling and keep you posted." . . . John R. Nichols, Jr., has moved to the Washington area. He works for Mitre Corporation, and will be here for approximately two years on a project for the Federal Aviation Agency. I talked with John on the telephone and learned that he and his wife, the former Laura Littlefield, have four daughters, aged 19, 18, 17, and 12. . . . Martin King of Fairlawn, N.J., was elected president last spring of the M.I.T. Club of Northern New Jersey. . . . Note that the *Review* now has a Course Notes section. As course correspondents are enlisted, the activities of alumni who received graduate degrees with our class will be covered in those columns. We regret that ties with some of the most newsworthy members of our class will be weakened but look forward with optimism to the new arrangement.—Paul M. Robinson, Jr., Secretary, 7710 Jansen Dr., Springfield, Va. 22150, 202-695-0351 (office), 703-451-8580 (res.); Paul M. Heilman, 2d, Assistant Secretary, 30 Ellery Lane, Westport, Conn. 06880, 203-227-3469; John G. Barmby, Assistant Secretary, IIT Research Institute, 1200 17th St., N.W., Washington, D.C. 20036, 202-292-1610

'47

The 20th Reunion Committee is hard at work finalizing the details of our forthcoming reunion which will undoubtedly break all attendance records. Statistics indicate that it's easier to recognize your classmates at a twentieth reunion as compared to the twenty-fifth because of the loss of hair that takes place during this period. Now that you're back from the nearest mirror, I'll start with some news. Ben Z. Ranan has been promoted to the position of manager of the Diode and Special Products Division at Transitron Electronic Corporation. He was previously manufacturing manager. . . . Edwin S. Lawrence has been appointed manager of General Electric's foundry department plant at Elmira, N.Y. Ed has been with G.E. since graduation. For the past two years he has served as a consultant with G.E.'s Manufacturing Services. Ed and his wife Beverly have two children. . . . Eugene V. Dotter presented a paper, "Analysis and Design of Reticulated Plates and Shells," at a symposium in Leningrad in September. He is chief structural engineer and an associate of Deeter-Ritchey-Sippel, Pittsburgh architects, planners and engineers. . . . Andrew F. Corry, Jr., has been selected to participate in the 50th session of the Advanced Management Program, a special 13 week course at the Harvard Business School. . . . Dr. Robert E. Savage has been named assistant to the manager of the market development department of the International Nickel Company, Inc. Dr. Savage has been employed by International Nickel since 1949. He resides in Westfield, N.J., with his wife Ann and their three children. . . . Col. Edward E. Bennet is the new commander of the Chicago district of the Army Corps of Engineers. . . . Capt. John C. Doherty is commander of the Weymouth Naval Air Station. . . . Captain John I. Hardy is commanding officer of the U.S. Naval Ordnance Test Station, China Lake, Calif. . . . Captain James A. Dare is commanding officer of the Naval Ordnance Laboratory. . . . Al Petschek is on leave of absence from Los Alamos Scientific Laboratory and is serving as professor of physics at New Mexico Institute of Mining and Technology. After graduating from Tech he obtained his M.S. and Ph.D. degrees from the University of Michigan and University of Rochester, N.Y., respectively. . . . Dr. Alfred M. Webb now heads the office of program planning in the National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Md. . . . Now for some address changes: G. William Rollossen, 425 Grant Ave., Palo Alto, Calif.; Alexander B. Ward, 298 Hickory Hill Road, Chagrin Falls, Ohio; Carroll A. Andrews, 12525 Two Farm Drive, Silver Spring, Md.; Marshall N. Arlin, 528 Theresa Drive, Boulder, Colo.; Robert Cohen, 106 Rue du Pont Du Jour, 92 Boulogne, France; Burton B. Crocker, Monsanto Company, 800 No. Lindburgh Blvd., St. Louis, Mo.; Domenic M. Bacari, 55 Reservoir Road, Cohasset, Mass.; Edward P. Brandeau, 33 Oakley Ave.,

Summitt, N.J.; Dr. Robert W. Balluffi, 120 Eastward Terrace, Ithaca, N.Y.; James H. Fitzgerald, 36 Irving Street, Boston, Mass.; Howard A. Zwemer, 9507 Carroll Lane, Kensington, Md.; Grant Umberger, General Electric Supply, 1260 Boston Ave., Bridgeport, Conn.; Horace Robson, Apt. 26B, 555 S. McDonough St., Montgomery, Ala.; R. Langdon Wales, Moccasin Hill, Lincoln, Mass. That's all for this month. . . . Be sure to watch for the 20th Reunion details!—Martin M. Phillips, Secretary, 41 Avalon Road, Waban, Mass. 02168

'49

So far as I know, it has been seventeen years since Nat Sokal has laid eyes on me. Yet the other day when I walked in on the end of a lecture which he was giving at Raytheon, he looked up and said, "Hi, Fletch." Just like that! You could have knocked me over with a diode. Nat is president of a firm called Design Automation, Inc., 4 Tyler Road, Lexington, Mass. He can help you design electronic circuits by using his highly sophisticated computers and save time and money in the bargain. . . . Parker Painter is head of the Electronics Division of General Dynamics Corporation according to an announcement by Roger Lewis, president. Earlier in his career, Parker was a founder of Dynatronics, Inc., producers of advanced telemetry equipment in Orlando, Fla. . . . Dr. Alexander MacDonald is the author of a new book on *Microwave Breakdown in Gases* published by John Wiley. He is a consulting scientist at the Lockheed Palo Alto Research Labs. . . . Dr. George Shultz, Dean of the University of Chicago's Graduate School of Business, was elected to the Board of Directors of General American Transportation Corporation on September 16, 1966. He is a nationally known authority on industrial relations and has written numerous books and articles on the subject. Prior to joining the University of Chicago in 1957, he was associate professor of industrial relations at M.I.T. . . . Harold Ingraham, C.L.U., has been appointed Actuary of the Indianapolis Life Insurance Company. Harold has been an actuary for seventeen years. He became a Fellow in the Society of Actuaries in 1959 and received his Chartered Life Underwriter designation in 1961. He is married and has three children. . . . Earl Eames has been appointed Vice-president, Operations, for the Council for International Progress in Management (CIPM), New York City. The council does pretty much what its name implies by planning and carrying out programs of technical assistance and management development in Latin America, Africa, and Asia and providing international management information and services for its members. Earl was recently in Rotterdam where he was a member of the U.S. delegation to the 14th International Management Congress. He lives with his family in Manhasset, Long Island, N.Y. . . . The firm of Bolt, Beranek, and Newman, Inc., of Cambridge, Mass., has received the Frank P. Brown

Medal for discoveries and inventions in the building and allied industries. This honor, awarded by The Franklin Institute, was accepted on behalf of the firm by **Robert B. Newman**.

I lack all but the barest details on **Richard T. Noe** who died on June 8, 1966. His address was listed in the notice which I received as: Ford Motor Company, Styling Center, Dearborn, Mich. Dick's friendly smile was a familiar sight on campus, and I would be grateful to anyone who can send further information.—**Fletcher Eaton**, Secretary, 42 Perry Drive, Needham, Mass. 02192

'51

Herb H. Woodson was one of the "eminent engineering educators" who participated in a panel discussion last March 24 sponsored by the Power Engineering Education Committee of the IEEE Power Group. The group reviewed the American Society for Engineering Education report on "Goals of Engineering Education." . . . **Mrs. Marion E. Langstaff** has three children and enjoys camping, hiking and playing in a string ensemble—while pursuing a career as senior planner in the King County planning department, Seattle, Wash. . . . **Thomas R. Stansfield, Jr.**, is living in Dayton, Ohio, and is the head of N.C.R.'s Applications Research Department. He's married and has four children. He saw **Don (Gordon D.) Shaw** many times last summer during the short period Don lived in Dayton. The Shaws now live in Elgin, Ill., where Don is engineering manager of Dukane Corporation. . . . **Captain Thomas J. Sullivan, Jr.**, has completed three years of duty in Washington, D.C. and has one more to go. He lives in Falls Church, Va., with wife Mary, Catherine 2½ and William 1. He is a Council Member for the American Society of Naval Engineers and manager of a little league baseball team. In November his post was changed to Naval Board of Inspection and Survey. . . . **Hank Helfrich** reports that his family lumber business discontinued operations in June 1965. He accepted a position with the Sweetheart Cup Division of the Maryland Cup Corporation and lives in the Baltimore area with his wife Mary and their four children Bill (12), Patty (8), Jim (6) and Katie (5). . . . **Jim Michelman** (wife Enid, children Lise 10, Doug 7 and Tom 5) is executive vice-president at Mainzer Minton Company, Inc., a New York City textile converters firm. . . . **Alan T. Ashby**, his wife Janet and their children Ann (14), James (11), and Allison (9) are in the Chicago area where Al is associated with Stewart Warner Electronics. . . . **Charles (Chuck) Haeuser**, A.I.A., has formed a partnership with Wm. Losch, A.I.A.—Losch and Haeuser, Architects. Their practice includes schools, libraries, office buildings, churches, residences, etc. Chuck and his wife Adrienne have travelled a bit as indicated by their children Tex (13) born in San Antonio, Gus (12) in Aachen, Germany, and Heidi (11) and Tony (9) in Milwaukee. Chuck reports that **Larry Bray** is practicing architecture

in Sheboygen, Wisc., and is specializing in schools. That is a lot of news on one postcard. . . . **Carroll F. White**, wife Alice and children Lance (13), Pamela (11) and Douglas (8) are in the New York City area. Carroll is vice-president, Overseas Chemical Division, of W. R. Grace. He travels overseas regularly and, as a result, particularly appreciates the fact that his family is gradually joining him on the ski slopes and the golf course. . . . **Theodore F. Trimble**, his wife Vera and their family Red (15), Eric (12), Matt (8) and Amy (7) are in the Detroit area. . . .

John L. Paige (wife Dorothy, children Mary 11, Nadia 9, Cynthia 7 and John Jr. 5) is still working for the Chemical Division of U.S. Rubber. He makes frequent trips to Louisiana on a new EPDM Synthetic Rubber Plant. . . . **George L. Larse** (wife Alice, children John 13, Jaia 12, David 8 and Peter 2) writes that he's still, after 15 years, at Lockheed Missiles and Space Company and is an assistant manager of a space program (he didn't say which one). He attended the Executive Training Program at M.I.T. last March and April. . . . **Thomas P. Kelly, Jr.** (six children—status quo since his last report) is vice-president and general manager of Kelly Chemical Products, Gardner, Mass. . . . The Rev. **Charles R. MacDonald**, his wife Jeanne and their children Robert (5½) and Susan (2½) have returned to Virginia where he is studying at the Graduate School of Union Theological Seminary after seven years in the Presbyterian Pastorate. He heard from **Bob Knopf** in Norfolk just before Bob left for Viet Nam. Good luck, Bob. . . . **George H. Elmer, Jr.**, his wife Rose Marie and children George Mitchell (8) and Lauren Rose (6) moved to Wilmington from Victoria, Texas. George is still with DuPont in the Plastics Department, Manufacturing Division. He is responsible for liaison in electrical power and process control for two large projects installed at Victoria this year. . . . **Roger G. Christman** (wife Mary and children Daniel 12, Diana 10, Eileen 8 and Ellen 6) has a new job at the Homer Research Lab. of the Bethlehem Steel Corporation after spending eight years with the Westinghouse Atomic Power Division in Pittsburgh. He completed masters degrees in chemical engineering and in mathematics at the University of Pittsburgh and he was quite active in Pittsburgh politics. . . . **Clark Abt** was formerly advanced systems manager at Raytheon until he became president of Abt Associates in Cambridge, Mass. His firm is engaged in operations research, systems analysis, social science applied to health, education, and welfare, military, or commerce. *Time* magazine (September 16, 1966), under "Research" had a very nice write-up on Clark under the title: "Games Businessmen Play." Among Abt Associates aptitudes is the ability to develop specialized "games" for businesses or the military to instruct personnel (including executives) how to understand or perform more effectively on a job. Clark and his wife Susan live in Cambridge. . . . With this column we would like to extend our best wishes to you for a very happy new year.—This month's author: **Marshall (Mickey) Alper**, Assistant Secre-

tary, 1130 Coronet Ave., Pasadena, Calif. 91107; Secretary, **Howard L. Livingston**, 58 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: **Walt Davis**, 346 Forest Ave., Brockton, Mass.; **Paul Smith**, 11 Old Farm Rd., N. Caldwell, N.J.

'53

Winter has arrived in Cambridge as has the end of another year. The amount of building construction is phenomenal, and those of you who have not been back to the Institute in recent years can expect to see some interesting additions. In addition to everything else there is being completed a fifteen story married couples dormitory in the Kendall Square area. The building looks quite plush and is certainly a far cry from the old "barracks" that some of us used. . . . **Edward F. Leonard**, X, co-authored a paper with Dean Wesley Hennessy for the *Columbia Engineering Quarterly* entitled, "Bioengineering—A New Professional Partnership." Ed is associate professor of chemical engineering at Columbia and prior to 1958 held teaching positions at the University of Pennsylvania where he also received his M.S. and Ph.D. in chemical engineering. At Columbia he is chairman of the Engineering School Committee on Bioengineering and his special interest is in the field of artificial organs and the rheology of blood. . . . All best wishes for the holiday season and the New Year. Please drop me a line with news of your activities.—**Norman R. Gardner**, Secretary, 100 Memorial Drive, Cambridge, Mass.

'54

Our supply of news has dwindled to four items this month. By the time this is printed many of you will have received some postcard questionnaires intended to bolster these columns in the future. These are being sent to those of you for whom recent address changes are known, courtesy of the *Review* office, the assumption being that the address change may signify an important event which you would share with the class here. . . . In October I travelled to Dallas to attend the Military Aircraft Systems Meeting sponsored by the A.I.A.A. (American Institute of Aeronautics and Astronautics) where I met a couple of classmates for the first time since graduation. . . . **Phil Perry**, X, attended for Pratt and Whitney where he is working on turbofan development for advanced fighter aircraft. Phil and his wife Margaret live in Glastonbury, Conn., and he spends his spare time working on a sailboat project. . . . Eddie Joe Swartz, XVI, due to some mixup, is not assigned to our class at present, but those of us who were in Aero remember him well. Eddie has been at L.T.V. (Ling Temco Vought) since last January where he is developing advanced concepts which will fly ten to fifteen years in the future. He, wife Ruby, sons Mark, 6, and Kevin, 3, and daughter Lisa, 2, are enjoying Texas after several years in sunny California. . . . During a

change of planes at Kennedy in New York I phoned **Frank Koch**, XVI, at a very opportune time. Wife Nancy had just presented him with twin boys, Robert Brian and Bruce Jenkins. The Kochs have another son David, 2, and recently moved to a new home in Centerport, Long Island. Frank has been conducting research in hypersonics for Grumman since 1954. . . . **Robert Rohner**, X, writes that after some occasional trips to Europe on various assignments for Stone and Webster Engineering Corporation, he is well settled in Boston in his new position (since June 1) as assistant chief process engineer of the Chemical Division.—**E. David Howes, Jr.**, Acting Secretary, Box 66, Carlisle, Mass. 01741

'56

More gleanings from those yellow questionnaires: **Jay Ball** now works for Medinet, a department of General Electric which is offering a time-sharing computer system for automating hospital functions. Jay was married in 1958 and now has three boys aged 2, 4, and 6. . . . **Howard Bertan** works for Airborne Instruments Laboratory doing research and development on radar systems. Howie received his masters in electrical engineering from Brooklyn Polytech in 1963 but is still going to night school. Howie and Marilyn were married in 1959 and have a daughter and a son. . . . **Ray Bowen** teaches academic research at the University of Wisconsin, Department of Chemical Engineering. Ray informs us that a recent survey of academicians nominated the department as the nations best for graduate study. The Bowens have a son, Ray Jr., and two daughters, Sandra and Susan. . . . **George Brattin** has worked for Dames and Moore in New York since last January as a project engineer specializing in soils and foundations. George has a masters in civil engineering from Columbia and is a professional engineer in New York State. Recently he combined a round-the-world trip with a six-month work stop at Tarbela Dam in Pakistan. . . . **Robert Carlson** is now an assistant professor at the Harvard Business School and spent the first half of 1966 teaching at Roberts College in Istanbul. . . . **Jim Dugelby** is a design engineer at the Aero-Commander Division of Rockwell Standard in Norman, Okla. Last fall he added the job of assistant professor at the University of Oklahoma on loan from his company. . . . **David Eaves** is a mathematics professor at Simon Fraser University in Barnaby, British Columbia, and was married in June. . . . **David Hanson** is assistant professor of statistics and

mathematics at the University of Missouri. . . . **Tom Jones** is a member of the senior staff at the research laboratories of Eastman Kodak in Rochester. . . . **Ted Korelitz** is the supervisor of computer programming at the Badger Company in Cambridge. The Korelitzes had their third child in September but managed to spend a month in Europe in April while Ted conducted a little business. . . . **Harvey Levine** became manufacturing manager of Newark Brush Company in New Jersey last June. In 1964 he added two patents to his credit. Harvey and Linda have three children, a son and two daughters. . . . **Bill Northfield** is vice-president of operations of Wilcox Electric Company in Kansas. . . . **Norman Siegler** is manager of control services in the engineering division of Xerox. Norm received his M.B.A. from the University of Rochester last June.—Co-secretaries: **Bruce B. Bredehoft**, 16 Millbrook Road, Westwood, Mass. 02090; **T. Guy Spencer, Jr.**, M.I.T., Room E19-439, Cambridge, Mass. 02139

'57

It is a good bet that by the time you get this issue there will be snow on the ground in the Berkshires. It is an even safer bet that by the time our tenth reunion starts on Friday, June the 9th, spring will have arrived at Jug End. Though your committee cannot guarantee the weather, we can say that the reunion will be a success. The response to our mailings has been excellent. The opportunity to get together with old friends and to make new ones is something you do not want to miss. If you are one of those who has not replied to the recent mailings then why not do it right now. Even if you are hesitant about your chances of coming because of business, pending births, or any other ponderous matter, do send in a reply—it will assure you of receiving the final spring mailings. . . . A number of clippings from newspapers describing activities of our classmates have been piling up over the past few months. This month I am devoting the column to such items. From an article in the *Boston Herald* I learned that **Bruce Blanchard**, now living in Phoenix, is a project engineer for the Bureau of Reclamation. In the article Bruce discusses the work of the Bureau and possible actions with respect to the water supply situation in New England. . . . A Michigan paper carried an article back in November 1965 on the activities of Holley Computer Products, a subsidiary of Control Data Corporation. **David Bloomfield** gets an extensive write-up. He is director of materiel administration for Holley. After spending a year and a half as an operations research analyst with Cleveland Graphite Bronze Company and two years in Germany as a Signal Corps officer, David went with I.B.M.'s large-scale computer plant in Poughkeepsie, N.Y., in 1961. During his four years with I.B.M. he held the positions of manager of manufacturing scheduling, manager of systems planning and analysis, and manager of purchasing. He joined Holley as the director of materiel in May of this

year. David is a member of the American Management Association and the Research Society of America. He and his wife and two children, ages 4 and 20 months, live in Southfield, Mich. . . . The I.E.E.E. student journal recently gave a write-up on the career of **Bill Hooper**. Following his studies at the school of Industrial Management from 1958-1960, during which time he was chief editor of the *Industrial Management Review*, Bill worked as a technical engineer for Procter and Gamble and participated in the M.I.T. Fellow Program in Africa. He was assistant to the regional controller (West Africa) of the Colonial Development Corporation, Lagos, Nigeria, and acting assistant secretary, Government of Western Nigeria, Ibadan, Nigeria. In the Office of Science and Technology his primary interest is in scientific and technical manpower and education issues, allocation of science resources, transportation research and development, and research in the urban environment. Bill holds membership in A.S.C.E. and the Society for International Development. . . . **Hugh Witt** was awarded the Air Force Association's Citation of Honor for outstanding contribution to the U.S. Air Force. Hugh is assigned at U.S.A.F. headquarters in Washington. He serves as deputy for supply and maintenance to the assistant secretary of the Air Force for installations and logistics. He received the citation for "outstanding professional competence and judgment throughout the entire range of Air Force supply and maintenance activities." Hugh was particularly cited for his management of the program to close four Air Force materiel areas and for his leadership in the Air Force Cost Reduction Program. . . . From the *Evening Eagle-Tribune* of Lawrence, Mass., I learned that **Harold Smith** has been awarded a White House fellowship. Harold began his government service as a White House fellow in September. He is married to the former Marian E. Bamford of Andover, Mass. . . . **Norman Peterson** is now a metal physics group leader at the Argonne National Laboratory. Norman was a National Science Foundation post-doctoral Fellow in Harwell, England, studying solid state physics. . . . **Frank Amoroso** has joined the M.I.T.R.E. Corporation's technical staff in Bedford. Following M.I.T., Frank studied at Purdue and University of Turin, Italy. Before joining M.I.T.R.E. he served for two years on the technical staff of R.C.A. in Princeton. . . . The progress reports I have been receiving from **Mal Jones** on the activities of the Reunion Committee are very fine. It looks like it's going to be a great reunion. I am very pleased that **Jack Currie** is contributing news on the reunion each month in conjunction with this column. Best wishes for the New Year.—**Frederick L. Morefield**, Secretary, 18 Whaddon House, William Mews, London, S.W. 1

'58

Received a letter from **Martin Victor**, now an M.D. and in his second year of residency in aero-space medicine. "After



William Northfield, '56

Duke Medical School and an internship there I joined the Air Force. Spent last year at Johns Hopkins where I received a M.P.H. (Masters in Public Health Administration). This year my family and I are in San Antonio, Texas, at Brooks Air Force Base." During this time he married the former Sara Jane Benson who, not to be outdone by degrees, has her A.B. from Russell Sage and M.A. from Tufts. They have two children, Philip age 8 and Beth age 6. . . . **Al Jarnagin** writes, "I was recently transferred from Seattle to New Jersey. Am manager of M&T. chemicals, Carteret, N.J., plant and slated to manage M&T's Elizabethport, N.J. plant now under construction. Living in Summit, N.J." . . . **Gerald Guralnik** has received his Ph.D. from Harvard and is now a faculty member at Rochester University. Gerry has received a grant from Imperial College, London University, and so will be spending this summer in England. . . . A note from **Mark D'Andrea** brings us up to date: "I am now working for the Flight Propulsion Division of General Electric in Everett, Mass. My position is as a manufacturing engineer in welding and related processes." . . . In the brief notes department we have two items. **Don Grimes** reports that he is "a metallurgist in the Research Department of Inland Steel Company—also am still a bachelor." . . . Second item is from **Hillel Auerbach**, noting that he is "now practicing law in New Haven, Conn., at 900 Chapel St." He is living in Orange, Conn., close to New Haven. . . . **Ralph Compton** had an article in the *I.E.E.E. Transactions* recently. After leaving M.I.T. he received M.Sc. an Ph.D. degrees from Ohio State University in electrical engineering in 1961 and 1964 respectively. He was with D.E.C.O. Electronics from 1958 to 1959 when he joined Battelle Memorial Institute in Columbus, Ohio. At Ohio State he became an assistant professor before accepting his present post as assistant professor of engineering at Case Institute of Technology. . . . Another recent author is **Steven Tannenbaum** who has an article in the *Journal of Food Science*. He is on the M.I.T. faculty in the Department of Nutrition and Food Science. I talked with Steve recently. He and his wife Carol are living in Framingham, Mass. They have one daughter, Lisa, five. This past September Steve went to Peru as a consultant for a United Nations study for food processing. He was there for several weeks investigating the complete cycle from crops to final processing. . . . That is all for this issue. Regards for the New Year and resolve to write or call with some news.—**Michael E. Brose**, Secretary, 1171 North Street, Walpole, Mass.; **Antonia D. Schuman**, Western Associate, 22400 Napa Street, Canoga Park, Calif.

'59

Greetings, '59ers, from your wayward Secretary. After all my beefing about not receiving any news, I missed another month of class notes. Lots of news has accumulated as a result, so I'll spare the commentary and give you the facts. . . . **Bob Broder** writes that he's spent three

years with the Navy as an operations officer on a destroyer; he took the Massachusetts registration exams in architecture recently and is awaiting the results. . . . **Henry Chadwick** received his M.E. from Yale in 1964 and is a candidate for a doctorate in electrical engineering at N.Y.U.; he was married to Miss Sheila Brass in 1965. . . . **Malcolm Chase** is working on a doctorate at Florida State in the field of chemical physics and expects to finish this year. . . . **Bob Couch** is enrolled in the nuclear engineering M.S. course at the Air Force Institute of Technology; he's married to the former Miss Marcia Harrington of Mesa, Ariz. . . . **Clyde Desper** has joined the Army Natick Laboratories.

. . . **William Finneran** has been appointed vice-president, advanced business systems, for John Felix Associates in New York City. . . . **Jim Hoffman** writes, "Sandy and I have finally done something worth mentioning in the class notes—our first child, Emily." . . . **John Jackson** has received his Ph.D. in Physical Chemistry from the University of Colorado and has authored five papers on topology and polymer systems; he's presently a research associate at the Institute of Molecular Biophysics at Florida State. . . . **Nicholas Janus** has joined Planning Research Corporation in Washington as a senior associate in the Aerospace Effectiveness Department. (See picture on page 94)

. . . **George Kraft** received his Ph.D. from Case last June and is working in the Electronic Switching Division of the Bell Telephone Laboratories. . . . **Harold Laeger** is the new promotion manager of *Popular Photography Magazine*; he was married last May to Miss Barbara Lev of New York City. . . . **John Leahy** has been named controller of the abrasive division of Norton Company. . . . **James McInnis** has been appointed production manager at Huggins Laboratories; he and his wife Catherine have settled down in San Jose with their eight children. . . . After receiving his M.B.A. and Ph.D. from Columbia Business School, **Steve Parkoff** spent two years as special projects officer on the staff of the Army Test and Evaluation Command; he earned the Army Commendation Medal during that time and on his release last year joined Operations Research Inc. as a manpower economist. . . . **Charles Roden** has been promoted to head of the Technology for Physical Design of Communications Equipment Department of Bell Telephone Laboratories. . . . **Fred Sellers** has won two \$1000 invention awards from I.B.M. for his work on a CRC tape error correction system and is presently writing a book on *Error Determining Logic*; he is married to the former Miss Margaret Lestina (Radcliffe '59) and has two children. . . . **Irvin Van Horn** has been presented with a special award of merit by Mobay Chemical Company for his "outstanding contributions to urethane chemical technology"; he is credited with five patent applications on improved processes for Mobay products. . . . **Frank von Hippel** has been appointed assistant professor of physics at Stanford; a Rhodes scholar with a Ph.D. in theoretical physics from Oxford, Frank has been working on elementary particle

problems as a research associate at Chicago and Cornell. . . . **Ed Vrablik** has been married since April 1961 and had a son, Kevin Allen, last August. Keep the news coming, and I'll try to keep better track of my deadlines. Best wishes for the new year—**Glenn Zeiders**, Secretary, 3 Rose Avenue, Watertown, Mass. 02172

'60

The newspaper in Jamaica, N.Y., ran a lengthy feature on one of our classmates last June: **Mike Kasser**, Research Director of the Technopulp Organization in Upper Montclair, N.J. In part, the article said, ". . . [he] already has a string of patents to his credit. For one, he's figured how to make cord tire yarn from coffee bean waste. He can tell you about paper development in German, Hungarian, Spanish, French, Italian, English—languages he learned while working in various countries and going to school at M.I.T. and Grenoble in France. . . . His ambition was to make a million by the time he reached 25. He's that age now and says he's a little disappointed. He's only half-way to the million mark. But he's got a lot of the signs of the man who has it made in a big way. Take housing. He has a place in Madrid to hang his hat when not living with the family in Upper Montclair." . . . **Conrad L'Heureux** was ordained to the Roman Catholic priesthood last May. He is a member of the Paulist Fathers and was assigned for summer 1966 to the Good Shepherd Church in New York City. He is now residing at the Paulist Information Center in Boston and is studying for his Ph.D. in the Department of Near Eastern Languages and Literature at Harvard. . . . **Richard de Neufville** has returned from Washington, D.C. where he was the White House Fellow assigned to work with Defense Secretary Robert McNamara. He is now an assistant professor of civil engineering at M.I.T. . . . **Howard Meadors** writes, "I was released from active duty with the Army in March 1966, and I have taken a position as a member of the technical staff at Bell Telephone Laboratories, Holmdel, N.J." . . . **Sylvester Minter** received a master's degree in electrical engineering in June 1966 from Brooklyn Polytechnic. He is now a senior associate engineer at the I.B.M. Watson Research Center in Yorktown Heights, N.Y. . . . **Russ Hamann** writes from Idaho: "Presently in the technical position of research hydraulic engineer with the Soil and Water Conservation Division, Agricultural Research Service (U.S.D.A.); working responsibilities are dual: research investigation leader, watershed engineering, and project leader for the Northwest Hydrology Research Center. . . . **Robert M. White** has been appointed assistant professor of physics at Stanford. (He received his Ph.D. there.) His field is theoretical solid state physics, particularly magnetism; he was a research associate at U.C.-Berkeley in 1965-66. Send your news to—**Linda G. Sprague**, 345 Brookline Street, Cambridge, Mass. 02139

'61

Joe Harrington now resides in Vienna and uses that central location to ferret out wayward '61ers. He writes that: "Grady Harris and I held our own get-together over here; herewith the news from the 1961 5-year Reunion (European Branch) held on July 9 in Salzburg, Austria. Grady is at the end of his postdoctoral year, which he spent in Paris at the French Petroleum Institute. He presented some papers on the results of his research at an international conference on magnetohydrodynamic power generation in Salzburg. He'll be at the University of Louvain, Belgium, until September 1, then will head for Dayton, Texas, and more research work, with Esso. He and Sue were looking forward to getting back to the U.S. after more than a year abroad. Diethild and I are just beginning our stay overseas, having arrived in March, and are well-settled in Vienna. My job at Reactor Center Seibersdorf is working out fine, and we are enjoying life here very much. Regards to all from Grady and myself." . . . The other letter that came in the mails recently was from **Marion Weiner**: "I've just received my Ph.D. in Mathematics from New York U. (October 1966), and I am now an assistant professor of math at Brooklyn College of the City University of N.Y. I'm enjoying teaching although the course load is heavy —12 hours. Next term I hope to have a reduced teaching load and thereby have time to combine my research work as well. Always glad to hear from old friends; I can be reached at Brooklyn College." . . . Social notes: back in June 1964 **Mike Pearlman** married Sydney Glass of Brookline, Mass. Mike is a doctoral candidate at Tufts and lives in Waltham. . . . **John Maslanka** married Lauretta Ann Schiesel (an R.N. at the M.I.T. Clinical Research center) last June. . . . **Si Schwartz** was getting a Ph.D. in Astronautics last June (at Polytechnic Institute of Brooklyn), but last January he was marrying Elizabeth Hradsky formerly of Wayside N.Y. now (along with Si) of Van Nuys, Calif. Si is at the Marquarot Corporation. . . . **Al Traver** lost his bachelorhood recently getting an M.S. in 1962 from Iowa State (Mechanical Engineering) and an M.R.S. from Carol V. Barnes (research assistant U. of Texas) in 1966. Al spent his time in between working for General Dynamics in Fort Worth. Now he is in Austin diligently working toward a Ph. D. at the University of Texas. . . . **Ron Uhlig** got his Ph.D. last February in high energy physics at the University of Maryland. Since then he has been on active duty for the Army fighting for motherhood and apple pie at the Pentagon. He is in the Army Information and Data Systems Command. Ron and Jane had a daughter, Kristin Marie, on September 28, 1965. . . . **John Robinson** entered the Army in 1963 and was an Ordnance Vehicle Test Officer in Yuma, Ariz. Two years later he emerged, none the worse for it, and started working for the R&D. Department at A.C. Electronics Division of

G.M. in Milwaukee where he is a project engineer. He has two children, apparently nameless, ages 1 and 5. . . . **Richard Chang** has two children also with undisclosed names (boy 4 and girl 1). He got his Ph.D. from Harvard in solid state physics last year. During this last year he worked as a research fellow and taught a lab course at Harvard. On July 1st, showing little loyalty to Boston (or Harvard), he moved to Yale where he is now an assistant professor in applied physics. . . . **Mike Feder** also has left Boston behind for the greener pastures of the University of Rhode Island where the P.H.D. he is working for is in electrical engineering. His children have names: Gary, 3½, and Judy, 2½. . . . **Akram El-Amin** "returned to Boston after 4 years in Baghdad, Iraq. I worked with the Iraqi Railways and Electricity Board. Now I'm employed as a structural engineering designer with Stone and Webster Engineering Corporation, Boston." . . . Over on the West Coast **Don Graham** received a Ph.D. in Operations Research from Stanford in 1965. Then he spent a year teaching there. Last spring his wife Sherie (Stanford '63) was rather busy having a baby girl, Heather, in April and getting a Ph.D. in Biology in June. This fall they all moved back East where Don starts teaching at Columbia's Graduate School of Business. . . . Remaining behind at Stanford is **Irwin Sobel** who is thoroughly enjoying California and is taking his time working for a Ph.D. in Electrical Engineering. . . . Also in California is **Richard Peterson** who recently accepted an appointment as the University-Community Planner at the U.C. Santa Barbara Campus. . . . **Bill Watson** graduated last June from Harvard Business School and started laboring for a company headed by another Watson, I.B.M. He is in Yorktown Heights at the Advanced Systems Development Division where he is in product development and market research.

The *Review* office sent me a blurb the other day saying that they will print appropriate pictures with the class notes. Please send informal and interesting pictures . . . families, national parks, playmates, dogs . . . you name it. If it's clean I'll try to get it printed. It should be a glossy enlargement that you don't expect to get back.

No column next month. I have some orals to take around deadline time, and they should keep me busy. I've tried to convince Harvard that these are just a mere formality and that they can just hand over the diploma and forget the exam, but they won't bite.—**Andrew Braum**, 1038 Beacon Street, Brookline, Mass. 02146

Nicholas Janus, '59; Grady Harris, '61



'62

Orrin Getz was released from the Army after serving for 27 months in West Germany. He is now working for the Hazeltine Corporation in the Project Administration Department and is living in his home town of Great Neck, N.Y. . . . **Robert L. Knighten** will earn his Ph.D. in Mathematics from M.I.T. and will then be an instructor at the University of Chicago. He was married in June, 1963, to the former Miss Carol Marians, who is also a graduate student in mathematics at M.I.T. She is obtaining her Ph.D. and will be teaching at the University of Illinois in Chicago Circle. . . . **Joseph Iemolo** received his S.M. degree in Industrial Management from M.I.T. He is now a Data Communications Consultant in the Eastern area of the Bell Telephone Company of Pennsylvania. He attended the Bell System Data Communications Training Program in 1965 and is presently a member of the M.I.T. Club in the Delaware Valley. . . . **Dr. Thomas S. Rowe** received his M.D. from the College of Physicians and Surgeons at Columbia University in June 1966 and is now an intern in surgery at Emory University Hospital in Atlanta, Ga. . . . **Kim Reyburn** finished his Ph.D. in Chemical Engineering at Oklahoma State University last June. He is going to work for Sinclair Research in Tulsa, Okla., in the Production Research Division. . . . **Dr. Diarmuid O'Mathuna** has joined N.A.S.A.'s Electronics Research Center in Cambridge, Mass., as a research mathematician in the Guidance Laboratory. Dr. O'Mathuna, who received his Ph.D. from M.I.T. in 1962, has been an instructor at Harvard Medical School and a research fellow at the Courant Institute at New York University. . . . **William McCrea**, whose study of the Cuban Revolution won the National Literary Award, has produced travel documentaries since 1961 and recently made a presentation and lecture including an hour and 40 minute color film on Portugal to several thousand people attending an annual Masonic Family Night in Worcester, Mass. . . . **D. E. Eastman** wrote an article entitled "Second-Order Magnetoelastic Properties of Yttrium Iron Garnet," which was printed in the *Journal of Applied Physics*. Also printed in the *Journal* was an article co-authored by **L. C. Skinner** entitled "Temperature Variation of the Ginzburg-Landau Parameter in Niobium Single Crystals." . . . In June 1966 **Ralph R. Miller** received his M.S. from Rutgers University. . . . **Joseph R. Bloomer** received his M.D. from Western Reserve University last June. . . . **Jon Luke**, who earned his M.S. at M.I.T. in 1963, has received his Ph.D. in applied mathematics from the California Institute of Technology. . . . **Vic Schneider** wrote that he received his Ph.D. from Northwestern University in computer sciences. He and his wife Lea are now in Washington, D.C., where Vic is working for Bellcomm. Bellcomm is N.A.S.A.'s consultant on planning problems for different

rocket programs. Vic expects to be working on picture transmission problems in the Space Technology Group. . . . Major David R. Scott received his M.S. in aeronautics and astronautics from M.I.T. in 1962, after graduating 5th in his class from West Point. After a tour of duty in Europe as a fighter pilot, Scott attended the Air Force Aerospace Research Pilot School, training ground for many of the nation's future space pilots. In 1963 he was chosen along with 13 others to be new astronaut-pilots. Last year he went aloft with Neil Armstrong in Gemini 8 and became the country's second "space-walker." Little did we know that we had a celebrity in our midst. Scott's thesis at M.I.T. was entitled "Interplanetary Navigation." He and his wife Ann have two children, Tracy, 5, and Douglas, 2. . . . Bojey Salmon, class President, writes that he is working in Construction Products Steel Sales with Bethlehem Steel in the Chicago office. He is in charge of bidding all of the highway work in Illinois and Iowa. He says that construction in Chicago is proceeding at a feverish rate and that each week brings the announcement of a new high rise condominium apartment building or office building or steel bridge or transmission line. In September he was appointed to the Educational Council for a three-year term. The Council is responsible for interviewing prospective M.I.T. entrants. He has been attending the evening M.B.A. program at Northwestern University. He hopes to obtain his degree in June 1968. The reunion committee, chaired by Ed Linde, met at Bojey's family home in Hingham, Mass., last August. The reunion will be at the White Cliffs of Plymouth in Massachusetts, a famous spot. It will be on June 10th and 11th and will cost about \$25 per person. We may be asking for \$5 class dues before then. Of course wives and dates will be invited. Activities will include golf, swimming, tennis, sightseeing, beach, sailing, and possibly a clam bake. Let's have a better turnout than the 25% of our class that contribute to the Alumni Fund and read these class notes. Tell your classmates that haven't been interested and involved over the past four years that now is the time to begin.

—Jerry Katell, Secretary, Oceanic Properties, Inc., One Bush St., San Francisco, Calif. 94104

'63

Bruce Peterson now has his M.S. in Astronomy from Caltech. Arsine Avakian, now Arsine Peterson, has also been awarded her M.S. in Astronomy from Caltech. Although no one told me definitely, coincidence suggests that she is Mrs. Bruce Peterson. . . . Charles Wende received his M.S. from the U. of Iowa last June. . . . John Flicker and Edward Kanegsberg both received Master's from Rutgers. . . . Maurice Andrien has been promoted to First Lt. in the Army. . . . Alan Ricketts is now with Digital Equipment Corporation in Maynard, Mass. . . . John Flaherty, who married the former Lois Talbot,



Alan Ricketts, Jr., '63; Robert Lenox, '64

Wellesley '63, and now has a 2½ year old son, is a fourth year med. student at Duke. He spent last summer at Mass. General. . . . Bob Kurtz has transferred from the University of Louisville Med. School to the Albert Einstein College of Medicine. . . . John Castle is with the Wall Street firm of Donaldson, Lufkin, and Jenrette. He and his wife, the former Lydia Sturm, now have a baby boy almost a year old. . . . Peter Politzer married Liza Izenberg, Douglas '65, last June. He is at Princeton doing his Ph.D. thesis. . . . Allen Clark and his wife Jeanne had a second baby girl last September. He is still at Tech. . . . Terry Foster will soon receive his Ph.D. in Structural Engineering and Mechanics from Berkeley. Steve Rudnick has formed his own consulting company in Boston. He is also working with Northeastern University helping them set up electrical engineering courses. Paul Milner is back at C.B.S. TV after two years in the Army. He is married and living in N.Y.C. If you have any news or hot stock tips, send them to—Bob Johnson, 245 E. 19 St., N.Y., N.Y. 10003

'64

Michael Auerbach is at Cornell in the Chemistry Department, where he has been awarded a research assistantship for this year. He was married in June to Sandra Goldman of Medford, Mass. . . . Pete Cooperberg is in his third year at McGill Medical School. He was in Boston for the month of November doing elective work in endocrinology. . . . Chuck Counselman is married to the former Eleanor Frey of Wellesley College '66. Both are now grad. students, she at B.U. in psychology and Chuck at M.I.T. in the Aero. Department's instrumentation program. . . . Juan Crawford is working in the Product Design Division of the M.E. Department at Battelle Memorial Institute. He has one son and one daughter. . . . Doug Currier served from June 1965 until April 1966 in Vietnam as commanding officer of a Coast Guard patrol boat. He was reassigned in May to the U.S. Coast Guard Academy as an instructor of electrical engineering. . . . Norman Davis is working for the Electric Boat Company and helping to build a two-man research submarine. . . . James Flink is studying for his Ph.D. in Food Science at M.I.T. . . . Anthony Heatwole had a delayed graduation at M.I.T. in electrical engineering this June. He is now working for Bell Labs in New Jersey. . . . Doug Hoyle received his

3
M.S. in Math from the U. of Arizona in June and is continuing there for his Ph.D.

. . . Bob Kimmel has passed his qualifying exams for a Ph.D. in Materials Engineering at M.I.T. His wife Deeanne teaches secondary school in Arlington. . . . M. A. Kovacs published an article in *Physical Review Letters* in August, along with four co-authors. The article summarizes their experimental studies of relaxation processes involving the CO₂ molecule, using a new technique with an infrared fluorescence produced by a laser. Their work is sponsored by N.A.S.A. and the Air Force. . . . Robert Lenox was awarded a scholarship by the U. of Vermont Med. School for this school year, based on academic qualifications. . . . Don Mided, after two years in the Peace Corps in Ecuador, is now at Stanford Business School. . . . Mike Morrissey, his wife, and their new daughter have moved to a new home in Rockville Centre, N.Y. . . . Melvin Oliven received his M.S. from the U. of Iowa in August. . . . Edward Olsen received his M.S. from Cal. Tech in Physics last June. . . . Glenn Orenstein received his M.S. in June from Rutgers. . . . Marilyn Pettit is now at the Harvard Business School, having decided he prefers business to the one year of law he had at Virginia Law School. . . . Otis Philbrick received his M.S. from Northeastern in June. He is now working for the Air Force Research Labs in Bedford, Mass. . . . Bob Sanders was married December 25th to Sara Legow of So. Orange, N.J., now a second year law student at B.U. Law School. Bob is working for Sylvania in the Boston area. . . . Dave Saul and his wife Sue both are working for I.B.M. Dave is a systems engineer working on the Apollo Moon Project, while Sue is a systems engineer for the computers at Harvard. . . . Ed Shibata had an article published in *Physical Review Letters* in July, along with two co-authors. The article concerns eta-meson branching ratios. . . . Pete Staeker was named freshman heavyweight crew coach at M.I.T. in September by athletic director Ross Smith. Pete rowed for the heavyweight crew while an undergraduate. . . . Bruce Strauss and his wife Judi had their "annual" Halloween Party on the witching day at their apartment in Watertown. Several members of the class were present. Bruce is working on his Ph.D. at M.I.T. . . . Michael Stulberg won the Soma Weiss Award last year in an annual research competition at the Harvard Med. School. That's the news for this month. All letters from classmates are more than welcome and guaranteed not to be kept confidential!—Ron Gilman, 202 A Holden Green, Cambridge, Mass. 02138

Graduate Students

VI

Emmett H. Bradley, S.M. '50, Vice-president and General Manager of Atlantic Research Corporation's Missiles Systems Division, is top executive at the new multi-million dollar missile plant in Costa

Mesa, California, dedicated in July 1966. The *Daily Pilot*, Costa Mesa's newspaper, celebrated the occasion with a special dedication souvenir edition, welcoming the new industry and featuring Mr. Bradley as "Space Man of Today." Atlantic Research is prime contractor for the ATHENA system of the Air Force, embracing the engineering, manufacturing and testing of the ATHENA vehicle, a solid propellant four-stage re-entry missile which fires its last two stages on its downward journey, thus gaining the speed necessary to simulate re-entry conditions of intercontinental ballistic missiles. The new facility is also engaged in other major contracts for the Army, Navy, Air Force and NASA. Mr. Bradley completed his S.M. program in one year under an M.I.T. fellowship award following his B.S. (summa cum laude) from Duke University in 1949. Beginning in September 1950 as Engineer with Melpar, Inc. in Falls Church, Va. he advanced rapidly to General Manager of Melpar's Special Products Division in 1960. He joined Atlantic Research Corporation in August 1962 as Assistant to a Vice President and has held his present position since January 1963. . . . **James L. Massey**, S.M. '60, Ph.D. '62, returned to M.I.T. in September 1966 as Visiting Associate Professor on leave from his alma mater, Notre Dame University, where he has served as Assistant Professor of Electrical Engineering during the past four years. In 1967 he returns to Notre Dame as Professor of Electrical Engineering. While a graduate student at M.I.T. as a National Science Foundation fellow, he became a member of the circuit-theory team under the leadership of Professor Amar G. Bose and, upon his return to Notre Dame taught a modified version of his material. Last year he developed a systems course for juniors and during the four years he has built up graduate courses in information theory and automata theory. During his doctoral study he began a consultation with Codex Corporation of Watertown which utilizes his design of error-correcting devices. During the current term he is teaching the graduate subject 6.754 (Transmission of Information) with Professors Elias and Gallager and in the spring will conduct discussions in advanced information theory along the lines of his special interests of coding, decoding and error-correcting codes. His doctoral dissertation, "Threshold Decoding," was published by the M.I.T. Press and his recent article on "Uniform Codes" in the *IEEE Transactions on Information Theory* shows that this classification of codes permits relatively simple encoding circuits which are of importance in space applications. . . . **Jaswant G. Krishnayya**, S.M. '60, E.E.'61, who returned to India last May after eight years in the United States (See Nov. 1966 *Technology Review*) has sent us some observations on the Indian scene as expressed in the following abstracts from his letter: "The I.I.M. (Indian Institute of Management) moved early this year to its unfinished Campus on the outer edge of Ahmedabad's residential suburbs. Nearby along the periphery are ATIRA (the textile re-

search center), the Physical Research Laboratory (specializing in Cosmic Ray and Space research), Gujarat University and the State Office Buildings (called the Secretariat, or Sachivalaya in Hindi). Not far away is the small hamlet (50 huts) of Vastrapur on whose fields the I.I.M. now grows. Just off the main road between us and the Sachivalaya is a clump of trees and a few huts around which some 200 buffaloes and cows are tethered every night. The Campus will eventually consist of 12 tall dormitory buildings, a classroom-office-library complex and 50 staff houses. As of now, three completed dormitory buildings house the dining halls, recreation rooms and offices for the staff. Students occupy most of the faculty bungalows, and the faculty lives in town. Two of the other unmarried Professors and I are making do with spare rooms on Campus. By April 1967 when the dormitories will be completed and there is expected to be proper housing even for junior faculty, any visitors will receive a decent welcome. Apart from being the capital of Gujarat State, Ahmedabad is a colorful town in a very colorful part of the country. It has grown to over 1½ million in its 500 year history, and great fortunes have been made in its textile industry, second only to Bombay in size. In the last five years there has been a tremendous building boom led by the co-operative housing societies, and novel, even avantgarde architecture can be seen on every side in the newer parts of town. The city itself is walled from its 15th century days under a Sultanate and there still stand many impressive gateway arches with magnificently studded wooden doors (now covered with movie posters). Gujarat contains many small and big princedoms, whose names and 'styles' lend color and variety to life. Recently 80 sites including a great port have been uncovered here that link this area to the Indus Valley civilization of 2500 B.C. North and East the land gets drier and merges with the great Rajasthan-Sind desert. South and West is rich cotton and groundnut land. Oil and gas have been snuffed and a large exploration effort is underway. Meanwhile one of India's first atomic power plants is expected to tie into the local electricity grid in 1968. And what of India? It is difficult to pin down my reaction. 1964-65 was a boom year according to all the figures I have seen, both for agriculture and industry. In April 1965 the Pakistan move on Kutch (100 miles from here) jolted the country, and the August attack on Kashmir and the simultaneous shut-off of U.S. credit arrangements caused a steep slide, destroying the economy of the backyard factories of the Punjab (India's Connecticut) and dropping overall industry indices by nearly 50%, so heavy is our dependence on transport and imported material. The failure of the rains was the last straw, and I personally have great admiration for those in decision making positions who continue to face the everlasting round of scarcity, need, and occasionally-generous-but-smug overseas observers. It comes as a surprise to find that a vast quantity of high quality everyday and specialized items are being made locally that former-

ly seemed destined always to be marked "Made in Great Britain." Prices, too, do not seem excessive. The Indian entrepreneur seems able to create opportunity, and this is the process I hope to accelerate through research into communication and information systems by advising on the use of computers and mathematical methods for business and government. So far I am involved in a reorganization of the State Motor Vehicles Department, a study of corporate use of Telex Systems and a Cost-Effectiveness analysis of atomic generators in an Electricity Grid, and there are other projects cooking. For those interested in *Sunshine* magazine, I should add that the Sunshine Press Fund Committee (13 Bowdoin Street, Cambridge, Mass. 02138) has shipped a small Mergenthaler press which we think will go into production by the end of the year. We hope to publish the first *Sunshine* book for children this year and then to bring out a regular series. With a monthly readership of 130,000, *Sunshine* does influence a segment of India's young people. Devaluation has raised paper costs (one-half our budget) by 60% and we fear this may undo much of the gain in circulation of the last few years unless we can find a way to secure gifts of paper from abroad. The 'crunch' comes in four months when we exhaust present supplies. Because I cannot get away from here easily I have been unable to reduce the load of work shared by my parents for *Sunshine* since 1954. We hope the financial situation will soon permit the appointment of a competent senior preson. (Their address remains *Sunshine*, Poona-1.)" We should explain that *Sunshine* magazine is edited and published by Mr. Krishnayya's parents and is intended to accelerate mutual understanding and friendship among young people of many countries. . . . **Mac E. Van Valkenburg**, S.M. '46, is now chairman of the Department of Electrical Engineering at Princeton University. He began his teaching career as a Teaching Fellow while in his senior year at the University of Utah and, after two years in the M.I.T. Radiation Laboratory, entered M.I.T. for graduate work in the fall of 1945. He returned to the University of Utah in 1946 where he became associate professor 1951-55, taking time out to complete his Ph.D. requirements at Stanford University in 1952. In 1955 he joined the electrical engineering faculty at the University of Illinois where he wrote his popular books *Network Analysis* and *Introduction to Modern Network Synthesis*. In 1963 he received the George Westinghouse Award in recognition of his outstanding teaching ability and his contributions to the improvement of teaching. At Illinois he was active as associate director of the interdepartmental Coordinated Science Laboratory. He is currently the editor of the *Proceedings of I.E.E.E.* . . . **Ivan E. Sutherland**, Ph.D. '63, joined the Harvard University Faculty in September 1966 as associate professor of electrical engineering in the Division of Engineering and Applied Physics. In his M.I.T. doctoral thesis "Sketchpad" he developed the technique of making designs on the face of a cathode-ray tube with a "light pen" and

push buttons coordinated with a suitable computer. An observer, seeing such a device in operation, feels distinctly that he has entered the realm of black and white magic, as figures are sketched and instantaneously stretched or shrunk, rotated, and assembled at the command of the operator. An electric filter, for example, can be sketched as a circuit diagram, and its response quickly calculated and displayed on the picture tube either in the time domain or the frequency domain. The time saved through such a design process can be tremendous. These techniques are increasingly utilized by several M.I.T. departments and at other institutions. The University of Michigan, for example, is basing a new computer language development partly on the sketchpad idea. Dr. Sutherland had an interesting article on "Computer Inputs and Outputs" in the September 1966 *Scientific American*. At Harvard he is doing research during the first semester to extend the graphical input-output communication with computers, and in the second semester may present a course on computer graphics. During the summer of 1966, he worked with the Digital Computers group in Lincoln Laboratory following two years as director of information-processing techniques at the Advanced Research Projects Agency of the United States Government. He received the B.S. degree from Carnegie Institute of Technology in 1959 and the S.M. from California Institute of Technology in 1960. He and Mrs. Sutherland and their two children reside in Belmont. . . .

William R. Hewlett, S.M. '36, president of Hewlett-Packard Company of Palo Alto, California, was elected on October 27, 1966, as a director of Chrysler Corporation. Founded in 1939 by Hewlett and David Packard, Hewlett-Packard is among the world's leading designers and manufacturers of electronic test equipment. When the firm was incorporated in 1947, Hewlett was named vice-president. He was elected executive vice-president in 1957 and president in 1964. He also is a director of the Kern County Land Company, FMC Corporation, the Rand Corporation, and the J. I. Case Company. Hewlett also serves as a trustee of Stanford University and Mills College. He is a member of the President's Science Advisory Committee, the President's General Advisory Committee on Foreign Assistance Programs, and the National Academy of Engineering. The new Chrysler director is co-author of numerous technical articles and holds several patents in the fields of electronics and scientific measurement. He is a fellow in the Institute of Electrical and Electronics Engineers and served as president of the Institute in 1954. He also is an honorary lifetime member of the Instrument Society of America. A World War II veteran, Hewlett served four years in the U. S. Army, attaining the rank of lieutenant colonel. He spent three years on the staff of the Chief Signal Officer and then headed the electronics section of the New Development Division of the War Department Special Staff. He received a bachelor of arts degree from Stanford University in 1934 and an electrical engineering degree

in 1939. Mr. Hewlett and his wife are the parents of three sons and two daughters and reside at 537 Coleridge, Palo Alto, California.

Billy H. Easter, S.M. '53, has taken a two-year leave from his teaching in the electrical engineering department of Texas Technological College to do doctoral study at Oklahoma State University under a National Science Foundation Science Faculty Fellowship. His field of study is control engineering and the supporting sciences. He writes that the enrollment at Texas Tech has more than doubled during his eleven years there, reaching over 16,000. Upon leaving M.I.T. he worked two years at General Dynamics in Fort Worth and has spent summers with Holloman Air Force Base, the Los Angeles Department of Water and Power, and the Halliburton Company. Course VI has had a succession of excellent graduate students from Texas Tech, under the teaching of Professor Easter as well as two former E.E. department heads, **Charles V. Bullen**, S.M. '27, and **Harold A. Spuhler**, S.M. '50. (See November 1966 Technology Review for report on Dr. Spuhler). . . .

Walter A. Sturm, S.M. '57, was in Boston October 31 attending a NASA symposium on multiprocessing in space. At our request he has supplied the following notes on his activities since his M.I.T. days: "In September 1957, having received my S.M. in Course VI under Bill Siebert, Margaret and I moved to Los Angeles. We both accepted positions at Hughes Aircraft Company, doing digital-computer system design and programming, and I began taking evening courses in the engineering extension of U.C.L.A. From September 1958 through June 1960, I was on leave from Hughes. I continued my course work while holding a three-quarter time appointment as Associate in Engineering at U.C.L.A. (This is equivalent to an instructorship, but does not disqualify a student by gaining him membership in the academic senate.) I taught upper-division courses, such as circuit theory, physics of active devices, linear amplifiers, logical design, and laboratory. Having finished my courses and examinations, including German and Russian, I returned to Hughes as a staff engineer to apply computers to antisubmarine warfare, and work evenings on my dissertation. Our first daughter, Nancy Ritsuko, was born in June 1962, and I moved to Litton's Data Systems Division in October to do system design on the Marine Tactical Data System. I was awarded the Ph.D. in Engineering from U.C.L.A. in June 1964, having majored in computers, information theory, and circuit theory. In August, I joined Aerospace Corporation (Ivan Getting, President) as a staff engineer in the Computer Systems Department. I was made Manager of the Software Section in March 1965. This is a system-engineering activity which is concerned with the design, validation, and use of various digital-computer programs which are used by the USAF for its space missions. Our second daughter, Diana Hiroko, was born in September (would you believe, Labor Day?). I have continued my interests in small-bore-rifle shooting, as Chief Instructor

of the Aerospace Employees Association Gun Club, and in duplicate bridge, having attained the rank of Advanced Senior Master in the American Contract Bridge League."—**Karl L. Wildes**, Correspondent, M.I.T. Room 4-232

XIII-A

With this issue we add to the section on Graduate Students a report on members of Course XIII-A, the Naval Construction and Engineering Program. We are pleased to announce that Captain **Robert E. Stark**, U.S. Navy, M.I.T. '48, will act as correspondent. Captain Stark was graduated from the U. S. Naval Academy in 1942. After three years in the European theatre of action aboard USS Philadelphia, he entered Course XIII-A in 1945 and completed the Naval Construction and Engineering Program in 1948. Since that time he has spent tours of duty in Naval Shipyards, the Bureau of Ships, David Taylor Model Basin, and the Office of the Chief of Naval Operations. His principal assignments have been in connection with the design and construction of naval ships, particularly aircraft carriers, guided missile cruisers and destroyers. Since 1965 Bob has been on the Faculty of the Institute as Professor of Naval Construction in the Department of Naval Architecture and Marine Engineering where he teaches courses in ship design and is registration officer for Course XIII-A. In addition he serves as Professor of Naval Science and Head of the Naval Science Department.—T. R.

Course XII-A has a long and proud history at M.I.T. going back to the days of "Tech on Boylston Street." The first three students were graduated in the very early years of the graduate program in Naval Architecture. Since 1904 there has been a steady stream of graduates ranging from a maximum of 36 in 1949 to only 2 in several of the early years. From 1904 through 1966 a total of 733 officers of the U. S. Navy completed the course. The U.S. Coast Guard joined the band wagon in 1941 and has since had 100 graduates. Foreign naval officers began coming in 1931 and a total of 139 from 16 different countries have completed the program. Brazil with 59, China with 21, and Canada with 16 have had the largest numbers of graduates. Currently there are 57 U. S. Navy officers, 8 Coast Guard officers, and 5 officers from foreign Navies enrolled. . . .

Commander Sherman C. Reed, U.S. Navy, M.I.T. '55, joined the Faculty in the Department of Naval Architecture and Marine Engineering this year as Associate Professor of Naval Engineering. Sherm comes to the Institute direct from duty in the Navy Department where he has been active in ship design with particular emphasis on new techniques in concept formulation. Sherm lives with his wife Bernie and their three children in Hingham, Mass. . . . The recent annual meeting of the Society of Naval Architects and Marine Engineers held in New York on 10 and 11 November was almost the equivalent of a class reunion for III-A graduates. Seated at the Guest Table dur-

ing the banquet were: **Emory S. Land** '07, Past President of the Society; **Andrew I. McKee** '21, Honorary Vice-President of the Society; **Ralph K. James** '33, Past President of the Society; **Henry A. Schade** '28, Vice-President of the Society; **Marvin H. Gluntz** '35, Secretary of the Society; **John J. Fee** '40, Rear Admiral USN, Vice-Commander, Naval Ship Systems Command; **Douglas B. Henderson** '43, Rear Admiral, U. S. Coast Guard, Chairman Chesapeake Section of the Society. . . . **Jacques B. Hadler** '47, presented a paper at the technical session on "The Prediction of Power Performance on Planning Craft." Jack is currently Head, Ship Powering Division, David Taylor Model Basin. He was awarded the Linnard Prize for his technical paper presented at the 1965 annual meeting. . . . Elected to the office of Vice-President were **Leroy V. Honsinger** '32, Manager of Shipbuilding, Todd Shipyards Corp.; **James M. Farrin** '33, Aerojet-General Corp. . . . Actively participating in the Technical Sessions were: **Nathan Sonenschein** '44, Rear Admiral, U. S. Navy, FDL Program Manager; **John H. McQuilkin** '40, Rear Admiral, U. S. Navy, Commander, San Francisco Bay Naval Shipyard; **James A. Brown** '41, Rear Admiral, U. S. Navy, Commander, Norfolk Naval Shipyard; **Dennett K. Ela** '44, Captain, U. S. Navy, Commanding Officer, David Taylor Model Basin; **Samuel R. Heller** '50, Captain, U. S. Navy, Naval Ship Engineering Center; **Amelio D'Archangelo** '41, Professor of Naval Architecture, University of Michigan. Among those seen earnestly discussing problems of the day were: **Carleton Shugg** '24, Vice-President, General Dynamics Corp.; **Armand M. Morgan** '29, General Electric Co.; **Schuyler Pyne** '30, Ebasco Services Inc.; **Robert A. Hinners** '32, Professor of Naval Architecture, Webb Institute; **Charles R. Watts** '33, Reynolds Metals Co.; **Robert L. Evans** '37, Quincy Division, General Dynamics Corp.; **Emery A. Grantham** '41, Rear Admiral, U. S. Navy, Deputy Commander, Naval Ship Systems Command; **John M. Ballinger** '41, Sun Shipbuilding and Drydock Co.; **Hubert B. Reece** '41, Captain, U. S. Navy, Supervisor of Shipbuilding, Camden; **William N. Price** '41, Lockheed Corp.; **Lewis A. Rupp** '43, Mobile Corp.; **John M. Waters** '44, Plax Corporation; **Robert V. Laney** '44, Manager, Quincy Division, General Dynamics Corp.; **James C. Oldfield** '44, Quincy Division, General Dynamics Corp.; **William D. Roseborough** '45, Sylvan Chemical Co.; **Theodore E. Gerber** '46, Socony Mobil Oil Co.; **Stanley H. Rice** '46, Captain, U. S. Coast Guard; **Charles E. Leising** '46, Captain, U. S. Coast Guard; **William H. Cross** '48, Riley Stoker Co.; **Robert G. Mills** '48, Captain, U. S. Navy, Philadelphia Naval Shipyard; **Robert E. Stark** '48, Captain, U. S. Navy, Massachusetts Institute of Technology; **Harold Hilmar** '48, E. B. Division, General Dynamics; **Robert Slaughter** '48, Ingalls Shipbuilding Corp.; **Richard Aroner** '51, Bowker Associates; **Richard T. Miller** '51, Captain, U. S. Navy, Naval Ship Systems Command; **Paul A. Gisvold** '52, Captain, U. S. Navy, Office of Industrial Relations; **Henry A. Hoffman** '52, Com-

mander, U. S. Navy, Office of Supervisor of Shipbuilding, Newport News; **Keating Keays** '55, E. B. Division, General Dynamics. . . . **Robert Warters** '64, Lieutenant Commander, U. S. Navy, visited the Department recently to discuss current efforts in ship concept formulation and the use of computers for this purpose. Bob is currently assigned to the Naval Ship Systems Command and is active in this field. . . . **Victor K. Atkins** '47, Manager, Doran Company of California, visited the Department in October. Vic has a son at Harvard and should be a frequent visitor to the area.—Captain **Robert E. Stark**, Correspondent, M.I.T. Room 5-304

M.I.T. Club of Delaware Valley: Northeast Corridor Transportation
The M.I.T. Club of Delaware Valley held its Fall Dinner Meeting at the Engineers' Club of Philadelphia on Tuesday, October 18, 1966. The speaker was Dr. Robert J. Hansen, Professor of Civil Engineering, M.I.T., who spoke on, "High Speed Ground Transportation in the Northeast Corridor." Professor Hansen's presentation was most interesting and was very well received by the 100 persons in attendance.—E. S. Halfmann, '36, Secretary

M.I.T. Club of Washington: Bronze Beaver Award Presented

The M.I.T. Club of Washington has received the Bronze Beaver Award from the Alumni Association for outstanding achievements in many fields of Alumni affairs. The award was presented by Mr. Howard Richardson, Vice-president of the Alumni Association, at the October 18 dinner meeting held at the Cosmos Club. Mr. Richardson cited the club's outstanding series of programs including the dinner meeting series featuring speakers outstanding in their fields, the Christmas luncheon for M.I.T. applicants, and the annual scientific seminars. The Washington Club also received plaudits for the excellent coordination of club activities, Alumni Fund Drives, and Educational Council Activities. The featured speaker at the October meeting was Professor William Siebert, Assistant Dean of the M.I.T. School of Engineering, and Director of Project Transport, the program studying possible solutions to the Northeast Corridor transportation problem. One hundred fifteen Alumni and guests heard Professor Siebert discuss such imaginative alternatives as underground pneumatic tubes utilizing motorless vehicles, electromagnetic surface trains, and ground effect machines. On Saturday afternoon, February 18, the club will sponsor a seminar on Management Sciences to be given in conjunction with the M.I.T. Sloan School of Management. Featured speakers will include Dean William F. Pounds of the Sloan School and Sloan Professor of Management Warren G. Bennis. It will again be held in the auditorium of the Institute for Defense Analyses Building, Arlington, Va., and will be open to all M.I.T. Alumni, students, and general public. Immediately following the seminar a buffet luncheon will be held in the IDA dining room.—Dan R. McConnell, '61, Correspondent, 4134A Suitland Road, Suitland, Md. 20023

M.I.T. Club of Kansas City: Director of Admissions Speaks at Dinner
On November 10 some 27 alumni and their wives had the delightful privilege of hearing Mr. Roland B. Greeley, Director of Admissions, speak of progress and policies at the Institute. Preceded by cocktails and an excellent buffet, Mr. Greeley's informal talk was both informative and pleasurable. His comments and the questions from the Club members ranged from admissions problems and objectives to the attitudes and activities of students and the future of the Institute in a technologically oriented world.—B. J. Kirkwood, '49, Secretary

Club News

M.I.T. Club of Boston: Foibles, Fables, and Fripberries

On December 8 the M.I.T. Club of Boston was treated to an entertaining talk on Boston folklore by Professor Douglas P. Adams of M.I.T. who has made the history of the city his avocation. Professor Adams recounted many anecdotes of Dame Boston's foibles, fables, and fripberries, as well as telling numerous tales of the city's seldom-seen silvery, seamy side. . . . At its next meeting on January 12 the Club will be addressed by Professor C. Stark Draper.—Eugene M. Darling, Jr., '53, Secretary-Treasurer

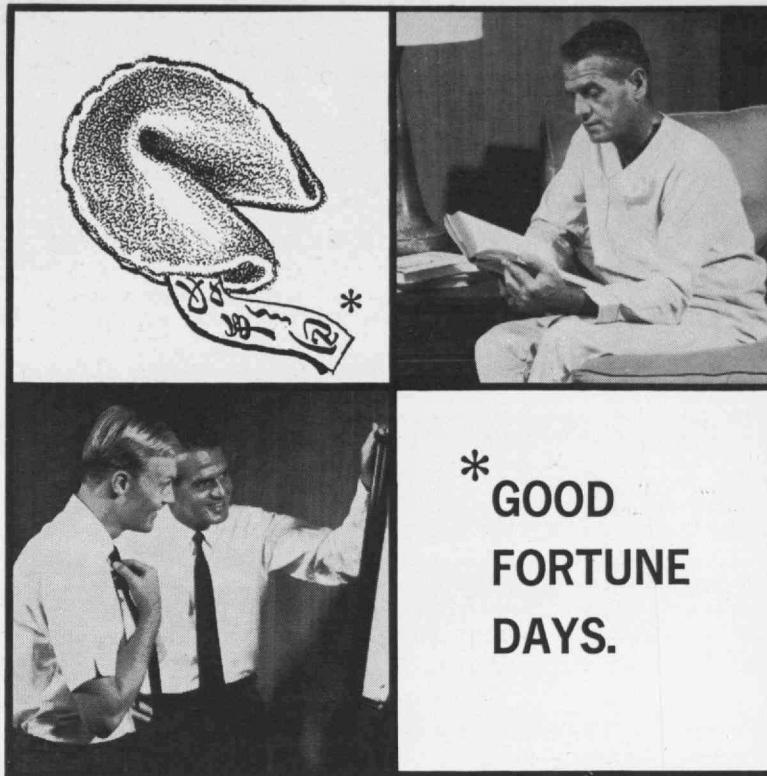
M.I.T. Club of the Connecticut Valley: Aviation Expectations of United

A great opening was planned for the 1966-1967 season of the M.I.T. Club of the Connecticut Valley for members, wives, and guests. The program featured Mr. James Wotton, Area Sales Manager of United Air Lines, telling about new equipment in aviation today and what to expect in the next ten years. He also showed a new film on Hawaii produced by United which is so new it has not yet been publicly released. This excellent program was preceded by cocktails and one of those famous dinners at the Yankee Pedlar in Holyoke, beginning at 6:30 p.m. on Wednesday, November 16.

The mid-winter meeting of the club will feature Halsey Heireshoff speaking on yacht design. The date and place will be announced in January.

M.I.T. Club of Northern New Jersey: "Guidance for Flight Vehicles"

The M.I.T. Club of Northern New Jersey held its first meeting of the 1966-1967 year on September 28 at the Hotel Suburban in East Orange, N.J. Institute Professor C. Stark Draper spoke on "Guidance for Flight Vehicles." Professor Draper reviewed the improvements which have been made over the past forty years in guidance systems and commented on the current state of the art. . . . Future meeting dates of the Club with their tentative topics are: February 28, 1967 (A talk by an Astronaut) and the Annual Dinner Meeting on May 24, 1967 (Dr. Stratton). —Donald B. Steiger, '55, Secretary



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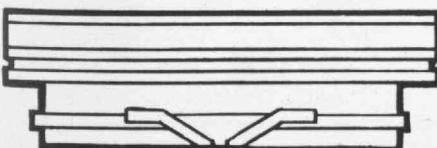
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